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THE CONSOLIDATED ELECTRIC LIGHT CO.

GEORGE WESTINGHOUSE, Jr., President,

OWNERS OF THE

SAWYER-MAN PATENTS,

GENERAL OFFICE:

32 Nassau Street, New York.

SPECIAL NOTICE.

THE MATHER ELECTRIC CO.

H. G. CHENEY, President,
ROBT. CHENEY, Vice President,
P. H. WOODWARD, Sec. and Treas.

N. T. PULSIFER, General Manager,
RICHARD H. MATHER, } Consulting Electricians.
WM. A. ANTHONY, }

MANCHESTER, CONN., March 3, 1888.

The Mather Electric Company hereby notifies its patrons that, with a view of protecting their interests and its steadily increasing business, it has obtained from the Consolidated Electric Light Company, the owner of the Sawyer-Man patents covering the manufacture, use, and sale of incandescent lamps, the protection of said patents, and will at an early date supply its patrons with lamps manufactured by the Sawyer-Man Electric Company, the commercial agent of the Consolidated Electric Light Company.

H. G. CHENEY, President.
N. T. PULSIFER, Gen'l Manager.

SAWYER-MAN ELECTRIC CO.

HENRY C. DAVIS, President,

COMMERCIAL AGENTS OF

THE CONSOLIDATED ELECTRIC LIGHT CO.,

GENERAL OFFICE:

32 Nassau Street, New York.

FACTORY:

510 to 536 WEST 23d STREET, NEW YORK.

ELECTRICAL REVIEW

ILLUSTRATED.

A WEEKLY JOURNAL OF

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Important Electrical Information by Way of Pittsburgh.

The *Bulletin*, of Pittsburgh, tells how electricity kills, as described by an "expert electrician," who—

"Asserts that it is not the electricity the human system receives that kills. Life is destroyed, wrenched from the subject of a superabundance of the fluid, by the discharge. In other words, if a man were converted into an electrical jar, he would prove an entirely trustworthy reservoir of electricity. Any quantity of the fluid might be 'banked' in him. But the moment it is drawn from him he drops lifeless, limp as the sparrow that falls from the wire."

So there were more cogent reasons for selecting Pittsburgh for the session of the recent convention than appeared on the surface after all.

What Boston Thinks of Execution by Electricity.

An enterprising local paper of Boston, realizing the interest at present felt in the question of capital punishment—the rope or electricity—has obtained the views of prominent Bostonians on the subject. Among those seen was Gen. B. F. Butler. "Upon the whole, and I have given the matter severe thought," said the ex-Governor, at the close of somewhat extended remarks, "I think execution should be by electricity." Mayor Hugh O'Brien thought that death by electricity would be in accordance with the advanced thought and ideas of the nineteenth century, but while advocating electricity if the death penalty must be inflicted, his honor was not in favor of capital punishment at all. Rev. Joseph Cook qualifies his statements very guardedly, but seems to have a leaning toward electricity if the death penalty must be paid. President Francis A. Walker, of the Institute of Technology, gives a masterly review of the question in the short time at his command, but does not commit himself. Ex-Gov. Claflin hopes to see electricity replace the gallows. Rev. M. J. Savage believes hanging should be abolished. John Boyle O'Reilly, Rev. Dr. Miner, Lt. Gov. Brackett, Rev. Dr. Bartol, ex-Gov. Rice, and many others were seen, nearly all of whom favored either the abolition of the death penalty, or making as painless as possible by electricity or other means.

Electricity Much the Safer.

A fire occurred the other night in Springfield, Illinois, and the *State Journal*, in its notice of the event, said: "The fire is supposed to have been started by an electric wire."

Next day the *Journal* published a note from A. L. Ide, president of the Springfield Electric Light Company. Mr. Ide said:

"For the information of persons that have that supposition I will state that the electric lamp was removed from that store and the electric wires disconnected Jan. 1; since which time no electric light current or wires have been nearer than the opposite side of the street, only two short pieces of wire remaining in the building since Jan. 1, and they had no connection whatever with the electric light circuit. I think it due to the Electric Light Company, as well as persons interested in the safest and best method of lighting that this misrepresentation should be corrected."

Mr. Ide said the other day, in a note to a Chicago friend, that he had "recently formed a very decided opinion that electricity is less dangerous than gas, because I have experimented with electricity for several years without being damaged, but I undertook my first experiment with gas recently, fooling with it with a view of producing incandescent lights, and had an explosion which broke two of my fingers, so that I have substantial grounds for this opinion."

Memories of a Pioneer Telegrapher.

When the first Morse telegraph line was being built from New York to Buffalo, there were skeptics who looked upon the whole project as a fraud, the projectors as schemers. Nothing but the known business integrity of such men as Henry Wells, William G. Fargo, James McKay, and that class of men, at the western end of the line, with Ezra Cornell, the Woods, of Central New York, and others of that ilk, could have made a "go" of what seemed, for a time, liable to drag interminably. The funds ran out when the wire had reached part way, and the West said let us see a line working with this wonderful method of conveying thought. Then, not before, will we assist you. To prove the probability, a line was built from Lockport to Buffalo, and the Buffalo office was located on Exchange street at the corner of Washington. Eventually, the line came into the same office from the East, and next door the lines subsequently came in from the West, while the Lockport end was extended into Canada, gradually reaching Toronto and connecting to the lower provinces.

Reading a notice of the destruction of that building where Buffalo's first telegraph office was, away back in 1846, brings up a host of memories of telegraphy in its babyhood, when relays weighed twenty pounds or more, and the register was a self-starter, with a bell to notify the receiving office that a message was coming. When people sent duplicate copies of their telegrams by mail for comparison, and the Grove battery zincs had to be soaked over night in water and amalgamated every day. When the hard driven mental head of one company evolved strange combinations of English words, or invented new ones to keep pace with the new order of things. One of these attempts would look oddly enough to-day, but it once had place over the receiving room of one of those early telegraph offices:

"ELECTRIC TELEGRAPHERY DISPATCHES COMMUNICATED."

That's the way the old, old timers used to be, do, and suffer, in that old corner, which, like so many of the jolly young chaps who took their first lessons in dots and dashes there, is gone, forever.

FIG. 1.—THE CABINET TELEPHONE SET OF THE AMERICAN TELEPHONE AND TELEGRAPH CO., SHOWING IMPROVED LONG DISTANCE TRANSMITTER.

The Electric Process on the Comstock.

Mr. Shepard Brickell, electrician of the Comstock mine, has placed five dynamos in the engine-room of the pan-mill and connected them by belt and pulley with the transmitted water-power. Ten or 20 pans are ready to run and 10 more are far advanced toward completion. Only half of the mill will be treated by the electric process at present, and the result will be compared with the workings of the other half.

The electric attachments to the pans are very simple propositions. The pans are wooden-coated inside, and the shoes are made of wood. The electric anode, or positive pole, consists of a flat, iron rim, fitting the pan, from which are suspended a large number of light iron pendants, and the bottom of the pan acts as the cathode or negative pole. The connection is made from the electric wire by four light iron rods, which sustain the weight of the whole. The pendants conduct the electricity to the quicksilver, help amalgamation and prevent flouring of the quicksilver.

Long-Distance Telephoning.

In considering the progress made in this country during the past ten years in introducing the telephone to commercial uses, an unprecedented development is at once apparent. Taken up in the beginning as an incomplete experiment, a wonderful toy, the telephone has developed into an indispensable adjunct of commercial business. No city or town of prominence is now without its telephone exchange, furnishing a quick and certain means of intercommunication to the business community, and its radial system of suburban lines connecting the surrounding territory with the commercial centers. Thousands of miles of wire connect the busy instruments, and more than a million "Hello's" sound the preludes to as many messages and their consequent replies transmitted daily by means of the telephone. Although of necessity a delicate and sensitive piece of apparatus, the telephone is probably used by one hundred times as many people as any other known electrical appliance. It is one of the wonderful features of the instrument that it has stood so successfully the test of such varied usage. During the earlier years of their introduction, the great and continued demand for telephones and exchange connections, necessarily led to the introduction of operating appliances which, although representing the best knowledge of their time, proved inadequate to the growth of the business. Exchanges were built, reached their limits and were rebuilt many times over in a space of a few years. Still the network of wires and cables increased, until to-day, the large exchanges, representing in many respects the aggregations of past years, are clogged with inductive and retarding influences, which experience only could have developed, and so labor along performing their local functions under a burden of intricate detail, which can by no means be appreciated by the uninitiated. One by one, however, the many difficulties have been met, and, by patient effort and extended experiments, the remedies have been discovered, until, at last, there have been developed means of providing a perfect telephone service, limited in extent only by the cost of suitable lines and equipment. The pioneer work in this new development has been undertaken by the American Telephone and Telegraph Company of New York, whose lines now radiate in all directions from New York, reaching Philadelphia, Albany, Troy, New Haven, Springfield, Worcester, Providence, Boston and all important intermediate points. Their construction has occupied nearly three years, and they represent to-day upwards of 15,000 miles of undoubtedly the most perfect lines of electrical conductors in the world. White cedar or Norway pine poles, from 50 to 90 feet long, are erected along the most direct highways, there being between 40 and 50 poles to the mile, according to the character of the country. A No. 6 iron guard wire is first strung between the poles from the iron-bound pin in the top of each. White pine cross-arms each 10½ feet long, and provided with ten pins and insulators, are bolted to the poles, and held firmly in place by iron braces. Fig. 2 illustrates the construction of this company's lines, as compared with the best telegraph

construction on the opposite side of the roadway. The line wires are of No. 12 hard drawn copper wire, weighing 170 pounds per mile. Each lot of this wire is specially tested for tensile strength and conductivity before leaving the factory. An expert force of men is employed in stringing the wire and in perfecting all the details of the construction work. The present lines of poles carry from 10 to 80 wires, the full capacity of the heavy lines being estimated at 100. Testing stations are located along the various routes from 30 to 50 miles apart, at each one of which a competent repair man is stationed. Rivers and bays are cabled by heavily insulated and armored conductors, terminating in snug cable houses on the banks. The experience in the operation and maintenance of these lines during the past year has been unprecedented. Days, weeks and months have passed on a number of the main lines without marking a single interruption. All wires being tested at an early hour each morning, any portion of the system can be reached and repairs made before the opening of business hours. In hail and sleet, wind, rain and floods, the long-distance lines have held their own and answered promptly to the call for service. No system of intercommunication heretofore devised has provided so perfect a means for the transaction of business between distant points as the long-distance telephone. By means of it, conversation is readily carried on between the parties present at the instruments, and all the benefits of a personal interview are secured without travel or loss of time.

Appreciating the great benefits to be derived from the use of such valuable facilities, the public response to the tender of service has been most gratifying. Representative bankers, brokers and manufacturers, and even great railway corporations, have found in the long-distance telephone a service which has never before been approximated. Great factories are brought into the closest relationship with their city offices. Important business transactions, heretofore requiring hours, or days of time, and dozens of telegrams or letters, are concluded definitely and satisfactorily in five minutes conversation by telephone. It has been said, if we have no haste in our communication we may write a letter; if a short or direct message only is to be sent, we may telegraph, but now if we have urgent business to transact, and wish to secure the advantages to be derived only from personal conversation, we may telephone. Here, therefore, is the growing and fruitful field for the perfected service. Successful to-day over many hundreds, who can predict how many thousands of miles shall mark its limitations?

Two of a Kind—And We Have Many More Like Them.

A Kind Word From New England.

To the Editor of Electrical Review:

The report of the Convention of the Electric Light Association in Pittsburgh, in your issue of February 25th, was a most agreeable surprise, and has won you many encomiums in this section.

It was a symmetrical "scoop" on your journalistic brethren, as well as a valuable and prompt recognition by you of the interest taken in the work of this important convention. F.

Boston, Mass., March 3.

Western Appreciation.

To the Editor of Electrical Review:

Much to my regret I was unable to attend the Pittsburgh Convention. Imagine my pleasure and surprise on the prompt receipt of the Review *of the same week*, with a comprehensive account of the proceedings of the electric light men during their entire three days' meeting. As not a line appeared in any other electrical journal of that week, you have scored what we call a "scoop" in the West.

Such enterprise is deserving of recognition. I take pleasure in renewing my subscription herewith, and also in sending you three new subscribers, whom I have easily persuaded to subscribe for such a bright and representative journal as the Electrical Review.

St. Louis, Mo., Feb. 28. Reader.

OUR KANSAS CITY LETTER.

(Special Correspondence.)

An ordinance was introduced in the council last June, and referred to the committee on public improvements, providing for granting a franchise to a subway company. The members of this company were J. Foster Rhodes, of Chicago, and L. R. Moore and H. P. Churchill, of Kansas City. The main points in this ordinance were that the main conduits should be laid parallel with the curb lines at such a distance from the curbs as not to interfere with water, gas and sewer pipes already laid; that the company should permit any other company or person to make use of the subways, and in case of disagreement upon terms they were to be decided by arbitrators, one to be selected by the conduit company, a second by the applying company, and the third by these two; that the fire and police alarms and telephone wires belonging to the city were to be admitted to the subways free of charge. The company gave notice that it had arranged to operate the Dorsett system. The committee on public improvements immediately resolved to visit all cities where the Dorsett system or any other subway system was in use. Then the subject was dropped, and nothing more was heard of it until last week. Last week, the public improvement committee, as the result of numerous and energetic proddings on the part of Messrs. Rhodes and associates, held a meeting for the purpose of considering the matter. Besides the representatives of the Dorsett system, there were also present representatives of the Inter-State Electric Conduit Company, and Messrs. Keith & Perry, each of whom had ordinances prepared granting them a franchise for conduits. The public improvement committee was greatly overpowered by this development of the conduit system, and immediately adjourned for two weeks to enable them to recover from the shock. In the meantime, the companies who will be compelled to patronize the subway system when it is established are smiling softly, and gently remark that there is more probability of being buried themselves than that their wires will be.

The third annual ball of the Telegraphers' Association took place at Music Hall this week. About 125 couples were present. A programme of twenty dances was sufficient to prolong the festivities to a late hour. An hour about midnight was devoted to the discussion of an elegant supper. The floor management was in the hands of Mr. George A. Beltes, who is a veteran, assisted by Messrs. J. A. Smith, W. A. Bloom, B. Barnes, H. T. Lynch, J. P. Altberger, C. H. Schell, J. B. Bracken, M. A. McDermott and Chester A. Beeson, and it goes without saying that no confusion of any kind marred the night's pleasure.

The Electric Light Company of Independence, Mo., is meeting with great success. Its Secretary, Mr. Hugh D. Wilson, stated to the Review's correspondent that since January 10th the company had contracted for and supplied 19 commercial arc lights in stores and over 300 incandescent lights in schools, stores and private houses. In order to supply these and other lights already contracted for, the company has erected 200 poles and strung over 26 miles of running copper wire. The company has also been operating 20 arc lights from dark until midnight for the benefit of the city, free of charge. The Board of Aldermen is now considering a proposition made by the company to continue these lights and a number in addition for a reasonable compensation. This company was fitted out by the Western Electric Light Company of Chicago, and at present has a capacity for 60 arc lights and 700 incandescent lights. The plans are already being prepared for practically doubling this capacity.

The city council of Cleburne, Tex., has contracted with the Thomson-Houston Electric Light Company to establish a plant there, and furnish the city with electric lights.

Topeka, Kansas, has purchased from the Jenney Company an electric light plant to light the city.

Greenville, Tex., has received a proposition from Messrs. H. B. Thomas, of Jefferson, and C. A. Murray, of Marshall, to establish an electric light plant. They offer to furnish street lights of 25 candle power for $1 a month. G. W. P.

Kansas City, Feb. 29.

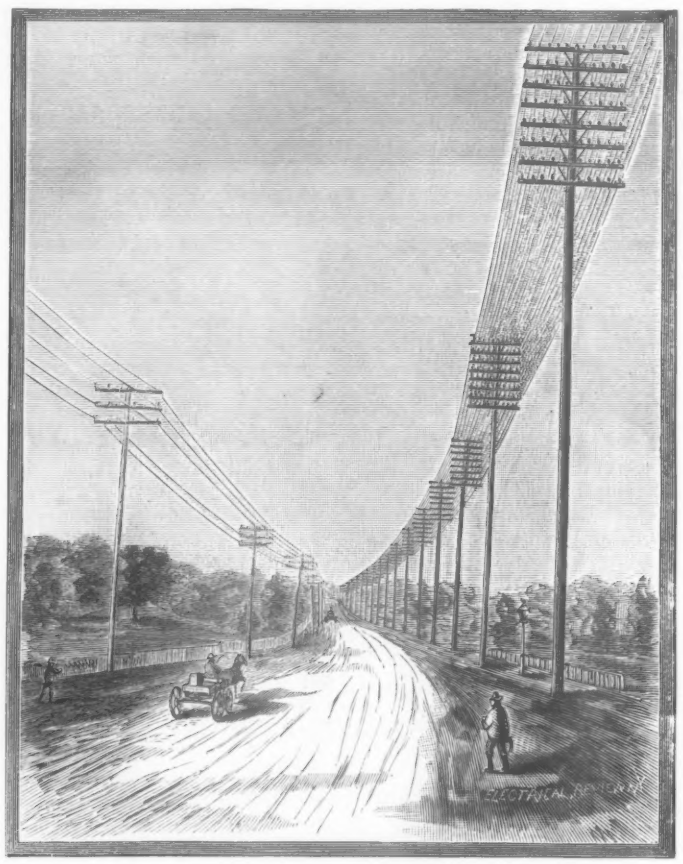


Fig. 2—View of Stretch of Long Distance Telephone Lines (on the Right), Near Yonkers, N. Y.

* * An Electric Aid Association has been organized in Buffalo, and the following officers elected: President, Tracy W. Niles; vice-president, Samuel Stewart; secretary, J. H. McNally; treasurer, John Lapey. An executive committee, composed of the above officers and F. Kitton, A. C. Terry, J. B. Slocum, A. J. Ferguson, J. T. Rooth, Miss N. Morgan and Miss I. H. White, was also chosen. A board of auditors, composed of John A. Pferd, Joseph Maxwell and C. W. Sears, was elected.

They Were Happiest at Taunton.

The London *Electrician* of January 20, last, contains the following:

"The second meeting of the Electric Lighting Committee of the Bath Town Council took place on Thursday, at the Guildhall. The Chairman said he had much pleasure in laying before the Committee the information asked for at the last meeting. With a view to obtaining it from the most reliable and independent sources, he had written to the scientific and technical papers devoted to electrical engineering, asking in what towns in the United Kingdom the electric light had been adopted, and in what places it had proved successful, or been abandoned. After a long discussion, it was pointed out that all agreed that the *most successful installation was the one at Taunton*, and the town clerk was requested to put himself in communication with the town clerk of that town, and ascertain particulars respecting the system in use there, and report the result of his inquiries at the next meeting."

The system in use at Taunton is the "Thomson-Houston," installed and started to work by Laing, Wharton & Down, of London, and now owned and worked at a good profit by a local lighting company.

The Electric Light for Elevated Cars.

We suppose that in course of time, the cars of the elevated railroads will be illuminated after dark with the electric light.

The oil lamps now in use often burn poorly and dimly. They are unsatisfactory. They are not the thing wanted. They are behind the age. They are unworthy of the rich corporation which is reaping heavy dividends from the privileges granted to them in our streets.

You will see a passenger straining his eyes to learn whether the other passenger over yonder, whom he could easily see in the daylight, or by the electric light, is an acquaintance.

You will see many a passenger straining his poor eyes yet harder all the way from the Brooklyn Bridge station or the Battery to Harlem to read the news in *The Evening Sun*, with which he desires to refresh and enrich his mind.

True, it would be better for him to consume our alluring columns before dark, or beneath the bright light of his own parlor at home as he rests in the rocker or armchair, wearing his dressing gown and slippers. But everybody cannot do that. Many a man can only snatch some such brief space of time for scanning his paper as that which he spends on the elevated trains after dark.

If the cars were lighted by electricity it would give him the chance to procure knowledge without the danger of blinding himself.

It would make the cars more wholesome than they are. It would make them more cheerful. It would make them pleasanter places for a chat with a friend.—*N. Y. Sun.*

Again About Lightning Rods.

To the Editor of Electrical Review:

Our attention has been called to the letter on "Lightning Conductors" by Major Heap inserted in a recent number of your Review.

We entirely concur in the remarks made in that letter, with one exception only. Major Heap suggests the use of strips of copper riveted together, end to end, to form a continuous band, and seems to assume that copper tape cannot be obtained in long lengths.

As a matter of fact, we have for many years fixed large numbers of lightning rods and almost exclusively used continuous lengths of copper tape ⅛ inch thick and in breadth varying from ⅝ inch up to 2 inches. These lengths varied according to circumstances, and in some cases amounted to 300 feet without a single joint. We are, sir,

Your obed't servants,

Paterson & Cooper.

London, Eng., Feb. 18, 1888.

* * The Elieson electric motor, from England, is being tried in Buffalo.

* * The new Edison station in Boston is to have the Edison recording steam gauge in its power room. This valuable factor in the intelligent management of steam plants is meeting with great favor in electric lighting circles.

Davenport, Ky.—The People's Light Company has been incorporated; capital, $10,000. James Thomson, and others, incorporators.

Newark, N. J.—The Electrical Manufacturing Company, N. J. Capital stock, $5,000. Paul W. Roder, and others, incorporators.

Hillsboro, Ill.—John McLean, William A. Howard and W. C. Milton, have formed an electric light company at Hillsboro, Ill. Capital, $5,000.

Eureka, Kan.—The Eureka, Kan., Electric Light Company has been incorporated with a capital of $25,000. A. S. Van De Mark is president.

Muncie, Ind.—The Heat, Light and Power Company, Muncie, Ind., has been incorporated. Capital, $50,000. James Boyce, and others, incorporators.

Hayward, Wis.—The Hayward Waterworks Company was incorporated February 16, with a capital stock of $50,000. E. H. Holbert is at its head.

Saginaw, Mich.—The West Side Electric Company, Saginaw, Mich., has been incorporated. Capital, $30,000. Farman C. Stone, and others, incorporators.

Everett, Mass.—The Everett Electric Light Company, Everett, Mass., has been incorporated. Capital, $10,000. Joseph A. Grant, and others, incorporators.

Chicago, Ill.—The People's Electric Light and Water Power Company, Chicago, Ill., has been incorporated. Capital, $200,000. Harry M. Packham, and others, incorporators.

Woodland, Cal.—The Consolidated Electric Light, Gas and Power Company, Woodland, Cal., has been incorporated. Capital, $100,000. A. D. Porter, and others, incorporators.

Williamstown, Mass.—The Williamstown Electric Light Company, Williamstown, Mass., has been incorporated. Capital, $15,000. Charles S. Cole, and others, incorporators.

Horton, Kan.—The Citizens' Light, Heat and Power Company, of Horton, Kan., has been incorporated with a capital of $10,000. W. P. Todd, C. W. Durfer and others are the incorporators.

Osage, Kan.—The Osage, Kan., Electric Light Company has been incorporated. The capital stock is given as $60,000, and the incorporators and directors are F. L. Green, C. D. Woodford, C. W. White, Hugh McNellis and C. B. Woodford.

Thayer, Kan.—The Kansas Electric Light Company, of Thayer, Neosho County, Kan., has been incorporated with a capital stock of $100,000. The incorporators are Charles A. Mitchell, of Cherryvale, Chatham T. Ewing, C. H. Zabriski, E. W. Ewing and M. D. Ewing, of Thayer.

Springfield, Ill.—The Electric Supply Company, of Springfield, Ill., for the purpose of manufacturing fire and burglar alarms and other electrical apparatus; capital, $50,000; incorporators, Andrew Scuchman, Robert B. Hoover, and Frank W. Wellman.

Little Rock, Ark.—The Bay Telephone Company, of Little Rock, Ark., has been incorporated. The object of the company is to manufacture and sell the Bay Telephone, an instrument recently patented by J. L. Bay, of that city. He is president of the company. The capital stock is $10,000.

Fort Scott, Kan.—The Fort Scott, Kan., Electric Lighting, Heating and Power Company has been incorporated. The capital stock has been placed at $100,000. The stockholders are W. D. McGreenston and C. S. Rusting, of Kansas City, T. P. Bailey, of Chicago, and C. F. Drake, H. H. Stout, A. W. Walburn and R. J. Harris, of Fort Scott. The Thomson-Houston system will be used.

Toledo, Ohio.—The Northern Ohio Electric Service Company was organized, with the following officers: L. S. Baumgardner, president; F. H. Seymour, of Detroit, vice-president; F. L. Geddes, secretary and treasurer; E. E. Dwight, F. H. Seymour, L. S. Baumgardner, I. H. Smead, and F. L. Geddes, directors. The company is organized, with a capital of $100,000, to push the manufacture and sale of the Johnson Automatic Heat Regulating apparatus.

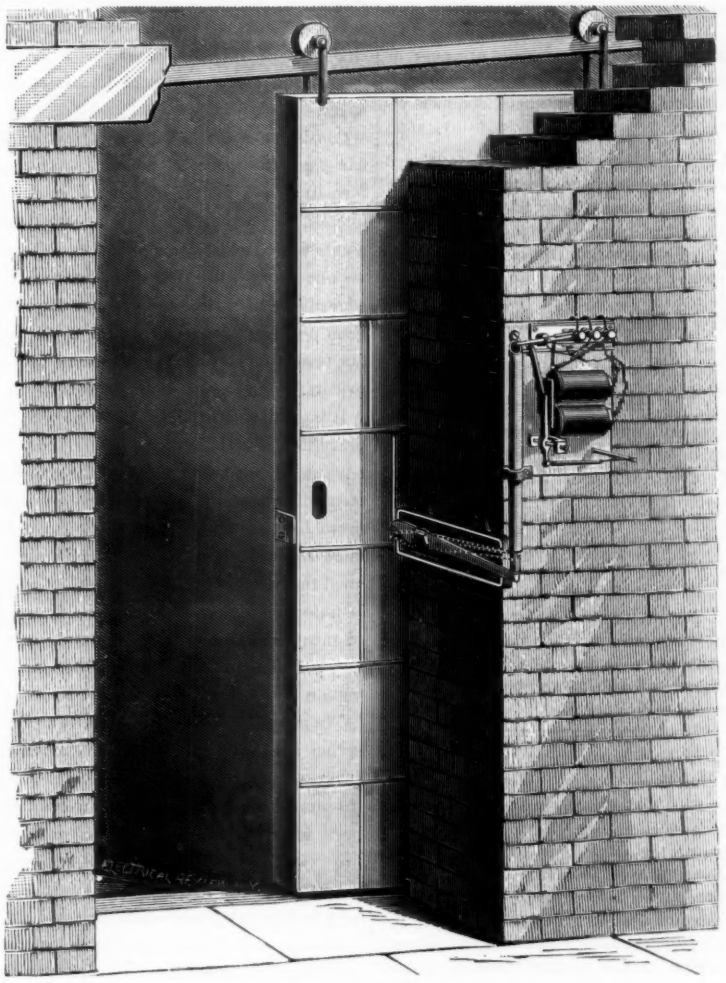
Buffalo, N. Y.—The New York Electric Light and Water Supply Company of Buffalo has been incorporated. The incorporators are James R. Silliman, George H. Pierce, Cyrenus C. Pickering, W. Bowen Moore and Hugh M. Cooper. As its name indicates the company is organized for the purpose of building electric light and water works in cities and towns throughout the country. Contracts are said to have been secured in Florida and Alabama. The capital stock is $50,000.

Kansas City, Mo.—The articles of incorporation of the Kansas City Electrical Company, have been filed. The capital stock is placed at $10,000, and is divided into 100 shares. The stockholders and incorporators, each of whom has twenty shares, are E. L. Martin, George M. Meyers, W. H. Woodring, Charles E. Kearney and Hon. Watson J. Ferry. The object of the company is the manufacture and the buying and selling of electrical instruments and supplies of all kinds, and the doing of all kind of work in which electrical apparatus can be used. In the same city, the Home Telegraph Company has been incorporated during the past week. It has a capital stock of $100,000. Its object is the owning and operating of telephone and telegraph systems, and the maintenance of a messenger and signal service by such means. The stockholders are Thomas E. Gaines, Charles E. Kearney, P. H. Madden, F. P. Perrin and John W. Spears.

The Tucker Electric Automatic Fire Door.

We illustrate on this page Tucker's patent automatic fire door, which is a sure method of confining a fire to the room in which it originates. In spite of the numerous inventions that have been made of late in automatic fire alarms, no effective means have heretofore been devised for successfully confining the fire in the room where it originates. Electricity again comes to the rescue and provides this fire door for that purpose.

The apparatus consists of one or more wooden doors, covered with sheet iron (this being a fire-proof door, under the rule of the Board of Fire Underwriters), sliding backward and forward on an inclined overhead track, and held open by means of an electric lock, until closed by hand, or, in case of fire, by the action of heat upon a thermostat. The electric lock is connected, by means of an open circuit battery and insulated wire, to one or more thermostats placed at the top of the room, and is direct acting, the bolt being withdrawn by means of a heavy spring, which is "tripped," or released, by means of an electro-magnet, the tripping device being so finely adjusted as to operate with a very slight electric current.



TUCKER ELECTRIC FIRE DOOR.

The thermostat may be set at any degree of temperature desired, generally 120 deg. Fahrenheit; if the temperature rises above the point fixed, the circuit closes, the bolt is thrown back, and the door closes by its own weight. An annunciator may be connected with the same circuit, giving immediate alarm, and indicating the room in which the fire is located. For storage warehouses, factories or extra hazardous rooms, this contrivance is desirable, as the closing of the iron door practically isolates the room in which the fire originates, and also checks the fire by cutting off ventilation. The Tucker Electrical Manufacturing Company, of this city, have discovered that there is quite an interest in this new invention, and are now exhibiting it at their office, 35 Broadway.

Our list of "New Corporations" would indicate, if their location is considered, that "Westward the Star of Empire" is certainly making its way.

The Telephone as a Convenience to Department Heads at Washington.

The telephone is quite an important factor in the prosecution of Government business. It is a great saving of time when the head of a department or bureau may turn to his telephone and speak at once to a subordinate a square or so away and up or down two or three flights of stairs. The departments are well supplied with telephones, though not quite as liberally as they were a year ago. Somebody a few months ago got a streak of economy and cut down the list materially. But there are scores and scores of them yet by which the department officers speak to their assistants or to one another or to the President. The department telephone is arranged on a swinging support, by which the official need not rise from his seat when he uses it. There is an exchange in the building. When the chief wants to talk to somebody, he swings the telephone round in front of him, turns the little crank under the desk, the exchange answers, and he calls for the party he wants and gets him in a hurry. The exchange in the building is probably run by a subordinate, and if it is you may be sure that he jumps. All subordinates in the Government service jump when the "boss" speaks. The Cabinet officers find the telephone so much a luxury that they have it in their houses as well as at their places of business. It enables the department people to converse with them as they linger over their 10 o'clock breakfasts, while the subordinates have been at their desks since 9 o'clock sharp. Woe to the luckless clerk who is 2 minutes behind the 9 o'clock stroke in arriving at the department, but the chief, who gets nearly ten times the salary and a Government carriage and driver and team to bring him, may sip his coffee at home at 10 or 12, give his orders by telephone, and ride down to the department at such hour as suits him. Besides the Cabinet residences, there is communication with House, Senate, the Chinese Legation, the British Legation, the Russian Legation and other representatives of foreign people and tongues. The telephone will carry Chinese, or Russian, or German, or even Corean, with accuracy.

A Mouse on a Telegraph Wire.

A queer mid-air spectacle was witnessed at noon yesterday by a whole boarding-house full of people and throngs of excited school children. A mouse was walking one of the high wires of the Pacific Postal Telegraph Company, opposite the Rossmore House, on Stockton street. When he was first beheld, the ladies in the rooms opposite gave a concerted scream, and there was a fluttering of handkerchiefs and general helplessness that was interesting to see. It was thought by some that it was his fell purpose to leap from the wire into one of the rooms, ten feet or more away.

He did not do this, however, and from his dizzy height continued to walk the wire. When he had got 30 feet away from the telegraph pole the mouse grew very timid, and scarcely advanced at all. At length he grew bolder, and finally made the perilous distance of over 300 feet to the next pole. The wire must have been at least 20 feet from the ground, and how the mouse got so high in the air on the wire and was enabled to walk it at all was a cause of much wonder to everybody.

A child at length explained the mystery of the mouse's queer journey by narrating how a black-and-tan dog had pursued it, making it take to the pole. When the mouse had completed his dangerous mid-air trip, he climbed down the pole and stepped on the hand of a looker-on, who carried him away in triumph. The mouse did not object to the proceeding at all. His spirit seemed completely broken by the terrors of his jaunt. —*San Francisco Examiner.*

—— The St. Joseph (Mo.) Electric Light Company will install one of the finest plants in the West. They will begin about April 1 to erect on their property, corner of Fourth and Mitchell avenue, a building two stories, 80 by 120, with a smoke stack 125 feet high. They propose using the alternating, or long distance system.

ELECTRICAL REVIEW

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EDITORIAL ANNOUNCEMENT

Address all communications and make all Express Money orders, P. O. orders and checks payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegragh and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Timothy W. Sprague, Massachusetts Institute of Technology, is our representative at Boston, Mass.

Mr. C. C. Haskins, 118 La Salle Street, Chicago, Ill., represents the REVIEW in the West.

NEW YORK, MARCH 17, 1888.

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Is not the REVIEW ELECTRICAL this week?

"Electric Power" is assuming proportions that make it deserving of the special prominence we give it in this issue.

"Engineer," in our issue of March 3, presented a number of interesting and pertinent points relating to electric motor railways.

Every line in the REVIEW this week, advertising and all, is set-up with new type. Our advertisers will note the artistic excellence displayed.

The REVIEW's description and illustration of the improved Edison phonograph is being copied quite extensively. To the credit of the copyists be it said, in nearly every case they show their appreciation by giving proper credit.

What is the matter with the one-time active inventors of live-forever primary batteries, which were to light houses and railway trains and furnish power inexhaustible? Have these frauds discovered that the American public can be imposed upon in this direction no longer? We hope so. The brilliant tales that were told of what these primary batteries would do gave evidence at times of positive genius. It is to be hoped such ability will find more legitimate channels in future.

Electric railway superintendents must not use salt in winter about conduit systems. A Pittsburgh company lately tried it thoughtlessly, and of course succeeded in setting fire to the woodwork of the conduit, the salt and melted snow forming an excellent conducting medium between the positive and negative conductors. As there was a difference of potential of 500 volts between the mains, the result was what might have been expected.

There are a number of very persuasive and eloquent gentlemen in charge of the advertising of manufacturers who desire to reach the electrical public. But, gentlemen, please remember that the value of the REVIEW in this respect is the result of a long established principle with its managers never to permit its reading columns to be encroached upon nor to permit its advertising pages to reach undue proportions. To the disappointed ones this week we present this word of explanation, and will try to plan so as to meet their wishes soon.

As we are going to press, the worst storm that has ever visited New York is in progress. The storm commenced Sunday night, and in a few hours it had made a desert of the city; it is something which we never thought possible.

To paralyze the pulse of New York was thought impossible. Yet, as we write, the entire city is under its dominion. Streets blockaded, traffic rendered impossible, and yet the REVIEW with its force are able to send this edition to their subscribers under all these difficulties.

The report of the New York telephone investigators, summarized on another page, must be disappointing to those unquiet minds who expected to prove that the companies were making fabulous sums. The expense contingent on telephone service, construction and maintenance, was a surprise to these parties. The result of all these weeks and months of investigation is the presentation of a bill to reduce the telephone rental in New York City from $12.50 per month to $6.50. We do not think such an arbitrary and unjust, and illegal, as we believe it to be, measure will ever be enacted in this State. At a time when the New York company is engaged in the expenditure of nearly half a million in the improvement of its telephone apparatus and general service, such an act comes with bad grace. We do not believe that two per cent. of the patrons of the telephone system in this city feel that they are overcharged for the service received. The facilities are unequalled anywhere in the world, and are maintained every minute, night or day, holiday or Sunday.

THE ELECTRICAL REVIEW.

The homely but trite adage "self praise is no recommendation" is as applicable to the management of a scientific journal as to anything else; but on the other hand, a proper appreciation by the management, of the dignity and aim of such a journal are as essential to success as a becoming modesty and an unflinching adherence to truth.

That the REVIEW has not offensively obtruded itself before its readers in the past; that it has, with full regard for the sanctity of truth in reporting scientific research, experiment and discovery, kept ever in the lead of electrical journals; that it has never failed to be the first to impartially chronicle the quick-marches of electrical progress and improvement; that it has ever been independent in tone and impartial in its treatment of all electrical subjects of interest; that it has in all this pleased and received the approbation of its readers and patrons, is best demonstrated by the REVIEW's ever increasing degree of success, both in the number and character of its subscribers, and in the quality and exclusiveness of its advertising pages.

Consistent with its starting principles, it has given the place of honor always to information and matter of general electrical interest, and no one ever saw an advertisement on the front page of the REVIEW, and no one every will. Our good friends, the advertisers, have time and again proffered us great pecuniary inducements for a place on our front page, but that page is sacred to our readers.

It is gratifying to thus glance back at the peaceful history of our past and feel that we have done something towards the development of a type of electrical and scientific journalism containing an element above the mere sordid love of pecuniary gain, an element that needs not the paid padding which is unfortunately so prominent in the pages of many contemporaries. It may be necessary *pabulum* to them; it would be contamination to the REVIEW.

We greet our readers this week in our new spring suit, with a tasteful and attractive cover and several important new departments in our columns, branch roads which have been added to the main line of electrical progress and development. The readers of the REVIEW will be treated constantly to the very best news in electrical matters and allied interests. Our staff has long included many of the foremost minds and ablest pens known in the world of electricity and its allied sciences, arts and professions, and the ranks are continually recruited. Their pens are wielded, too, in a manner to explain the mysteries of our science in the simplest language, avoiding as much as possible the dazzling, but to the mass of readers, unintelligible pyrotechnics of applied mathematics, the mist of calculus and the mazes of analytical geometry. Where possible these are given a wide berth. Some few questions, of course, can be discussed in no other way, but the REVIEW will always painstakingly strive to maintain its reputation for being what it is—a journal for electrical people especially, but likewise for the great reading public of America. Its popularity and supremacy in this respect are evinced by the readiness with which its articles are copied by all foreign journals, and extracts continually made by daily papers in the United States to meet the popular demand for knowledge of this wonderful science.

Equipped with every facility for first-class work, scientifically, practically, and typographically, the REVIEW is justly proud of the position it occupies to-day, and with unfeigned satisfaction points to its record in the past and yet hopes for better things in the future.

ALTERNATING VS. CONTINUOUS CURRENT SYSTEMS.

THE interesting paper read by Mr. H. Ward Leonard, of the Edison Company, before the Electric Club of Chicago, on the 5th inst., is quite a valuable contribution to the literature relating to these two methods of electrical distribution. The author of the paper is, of course, pledged to the low tension system, and cannot be considered to have been speaking with the judicial impartiality of the independent scientist. In short, the paper is an attack upon the alternating system. The advocates of that system, we presume, will not be slow to take up the gauntlet thus thrown down. They are strong, able and, at the present day, fairly numerous. They are perfectly competent to take care of themselves.

At the same time, we think that some allowance should, in all fairness, be made for the errors and indiscretions of youth. The continuous current systems of electrical distribution are a good deal older than the alternating, and such attacks are rather in the nature of a grown man pounding a boy. The advocates of the continuous current system have themselves had to learn by costly experience, and they should not be too hard on the weak points of a relatively young system. Perhaps, with the impetuosity of youth, the alternating men may assume the *"Let me get at him!"* attitude; to tell the truth, however, some of Mr. Leonard's criticisms are supported by facts. What the explanation of those facts may be, we leave to the supporters of the alternate current systems to say—whether these have been mere boyish errors, or inherent defects of constitution.

Mr. Leonard compares the two systems in the following respects: (1) First Cost; (2) Economy (Efficiency and Depreciation); (3) Reliability; (4) Variety and Value of the Possible Sources of Revenue; (5) Safety to life; (6) Effects upon existing property.

We would venture to criticize Mr. Leonard's method of expression in one respect. The impression which his words might convey is that the e. m. f. has something to do with the size of the conductor. This is, of course, true in a limited and indirect sense, but it is the current which is the real, direct factor to be considered. If one ampére is carried over a certain wire, it makes no difference to the heating effect whether the pressure behind it be 1 or 1,000 volts. Whatever loss there may be is, however, a greater percentage of 100 volts than it is of 1,000 volts.

The remarks of Mr. Leonard as to danger to life, or rather to person, are for the most part just, but we think he goes a little too far when he assumes and states that a 1,000 volt current is necessarily and always fatal. That is not correct. Under certain conditions it may be so, and it is certainly very unpleasant, but the best case may be injured by trying to prove too much. Undoubtedly, 1,000 volts is more dangerous than 100, so is gas more liable to explode than a tallow candle, and a locomotive more dangerous to life than a "one horse shay;" almost every convenience of modern civilization introduces an additional risk; usually, however, we take that risk, at the same time taking precautions to minimize it as far as possible. The force of Mr. Leonard's remarks in this direction is somewhat modified by his statement that the continuous current company he represents is using a system with a potential of 1,200 volts.

For distribution over a very limited area, we are inclined to agree with Mr. Leonard's contention that the direct low tension is just as economical as the alternating, but we always understood that the supporters of alternate current systems claimed that the special advantages of such a system were in the direction of long distance distribution.

The paper is a valuable one as, presenting the "low-tension" view of the matter. The other side will now, no doubt, have a few words to offer.

OUR CHICAGO LETTER.

(*Special Correspondence.*)

This gentle, ethereal spring idea is a jolly one for electric light currents. If there is any one thing that vigorous lighting of the home made variety likes and hankers after it is a wet, sloppy time, when the ground is frozen knee deep, so the water can back up in cellars and under sidewalks, and overflow the gutters and coal holes.

There have been two jolly electrical demonstrations arising from that sort of combination in Chicago within a week, both under sidewalks, and both resulting in no damage, save that arising from the cutting of the wires by the firemen.

On the 25th a mysterious explosion of gas in the conduit opposite Prof. Barrett's office, on La Salle street, startled the entire neighborhood. The manhole cover was blown upward five or six feet, and fell back nearly in place. There was no one at work in the manholes at the time, and no one was injured. The cover was fastened down at the time, and weighed about 75 pounds.

And again on the 27th a similar explosion at the corner of Fifth avenue and Washington street occured from the same cause, and was equally harmless in its results.

But a like occurrence in Buffalo, on the 25th, was less fortunate in its results. This explosion, or, rather, these explosions—there were two—occurred at almost the same instant, about 10.30 A. M.

The first blew up the cover of the manhole in front of the Coal and Iron Exchange, on Washington and Seneca streets, the correspondent says, "fifty feet," and it fell to the ground in pieces of about one foot in size. The second occurred opposite the Stafford House, with the same result. Two men, William G. Wood and Fred. Zott, of Chicago, working for the Western Electric Company, were in a third manhole, and were seriously injured. Their beards and hair were singed, and their faces and hands fearfully burned. The gas was lighted by a fire that one of the men had just lighted. Whether sewer gas, natural gas, artificial gas, or gas arising from the creosoted wood of which the conduits are built caused the explosion is not known. Zott will probably be scarred for life.

The Chicago River Plant has so well wormed itself into favor with river men that a long, strongly indorsed petition has been presented to the mayor, asking that the plant be extended to the mouth of the river, east of Rush street. The Central Elevator, Western Transit, Illinois Central Railroad, Goodrich, and the Peshtigo Companies, besides many others equally influential and interested parties, are represented in the demand.

The Western Electric Company, whose system this is, has done an excellent service for the west and north side people in the results obtained. By and by, when the vesselmen become a little better used to the new order of things, their choice will probably be for a free river after night, rather than a bridged river in daylight. It will come, and that, too, without bloodshed.

The Chicago Edison Company, at 185 Dearborn, expect to be ready with their first central (incandescent) station about the 15th of May. The Chicago Club, which was partially damaged by fire, some weeks since, is among the buildings wired for the new central system. Desirous of having the opening as complete as possible, the club asked, as a special favor, that the company would strain a point, and give the club light at once. It has been done. The dynamo is at a point on Monroe street, over three and a half blocks away, but the current does its work perfectly, and as nicely as if it were in the basement of the club house, and is the advance guard of the central three wire system.

Detroit is to have a central plant of storage batteries. The batteries will be arranged at various points along a power line, and a continuous current from the dynamo centre will keep them supplied with electrical energy. The system used will be that of the New York Accumulator Company. The City Hall is first to be lighted with 150 incandescents. The total capacity of the central station is fixed at 5,000, and it is expected that the company will have at least 3,000 lamps aglow by the first of September next.

The electrical idea seems to take well with west side Chicagoans as an application for rapid street car service. The people seem to favor the storage battery system as safer and easier to accomplish, in that it does away with the metallic conductors needed for a central station. C. C. H.

Chicago, March 10.

OUR BOSTON LETTER.

(*Special Correspondence.*)

Malden, Mass., is making preparations for a new station, Thomson-Houston system, of over 300 horse-power. There have recently been added to the plant 50 arc, and 250 incandescent lights.

The Rutland, Vt., Electric Light Company, operating the same system, have added 50 arc lights to an already large capacity.

The Sprague Motor agency in Boston has closed a contract to supply power for a roller toboggan slide in a neighboring city. Gravity will take the coasters down and electricity carries them up again for a fresh start.

The sale of the Ely copper mines in Vermont has been ratified at White River Junction, by payment of $18,000 to the receiver by Otto K. Krouse, of New York City, he having taken an assignment of the purchase at the auction, January 12.

The firm of Pettingell & Company, Milk street, Boston, will shortly remove to much more commodious quarters, a change rendered necessary by their fast increasing business in electric light, telephone and telegraph supplies.

Bridgeport, Conn., has added 800 incandescent lights to its Thomson-Houston plant.

Colonel Burnham, of the Gas Lighting Company, is taking a business trip through the far West.

The Evans Friction Pulley Company, Bellows Falls, Vt., has been organized for the manufacture of special machinery. The works will be located in the old office building of the Fall Mountain Paper Company, on Bridge street.

Newport, R. I., is to have a local electric light company. The Edison system will be used, and the incandescent light introduced into private houses.

The Simplex Tree Insulator is meeting with a great sale almost before it is on the market. Dr. Mason finds it difficult to keep even specimens in the office.

Mr. Frank Ridlon returned Saturday from his trip continued on from Pittsburgh to Baltimore, Washington and Chicago. He was agreeably surprised at the rapid advancement the Baxter motor has made, as evidenced in the orders received at the Baltimore factory. It was also pleasing to find many orders awaiting him at the Boston office.

A Thomson-Houston motor circuit will be opened in Haverhill, Mass., within a few days.

Mr. E. H. Batcheler, treasurer of the Simplex Electrical Company, is sojourning at present at Thomasville, Ga., recuperating and gaining needed rest in that balmy climate.

President Alexander, of the Electric Club, has returned from his Southern trip.

The new Electric and Machine Company now have their Sudbury street shops in full running order. They have a large floor space, well lighted, and with their skilled workmen and high-class machinery, are capable of turning out some very fine work. Their specialty is "everything in the line of electric and fine machine work," as one of the company remarked Saturday.

One of the younger firms in the city doing a large business in the annunciator, burglar alarm and house-wiring line, is Kendall & Slade, who have just taken a larger office at their Milk street location. T. W. S.

Boston, March 12.

So pleased is the Emperor Francis Joseph of Austria with the experiments in electric lighting in the Imperial Castle at Laniz, that he has ordered lights to be placed in every room in the castle. About 1,000 lamps will be required.

Personals Electrique.

Stephen Holbrooke, of Philadelphia, was a New York visitor last Saturday. The electric light company at Millville, of which he is president, is succeeding finely.

The many friends of Wm. S. Hine—the poet of the Electric Club—who has been quite ill at his home in Englewood, N. J., will all be glad to hear of his improvement. He will probably be able to return to business in another week.

Mr. Samuel M. Bryan, the well-informed telephone man of Washington, D. C., was a New York visitor last week. He is using a large quantity of cables in his work these days, and is taking quite an interest in electric lighting.

W. D. Sargent, W. N. Esterbrook and Joel C. Clark leave Wednesday for Jacksonville, Florida. Mr. Sargent will probably be absent a month recuperating his health, and the other gentlemen a shorter period. St. Augustine is their objective point.

Mr. Chas. Selden, of Baltimore, superintendent of telegraph for the B. & O. Ry., and also superintendent of the Western Union Telegraph Company in his territory, spent several days and uttered a number of brilliant electricalities in the metropolis this week.

Hon. Jay Hubbell, of Michigan, the widely known ex-Congressman, was an Electric Club visitor last week, the guest of Mr. John Stanton. He is, we believe, interested with Mr. Stanton in copper mines in his State, and of course desires to see the demand for electricity (*i. e.* copper) continually increase.

Mr. D. H. Bates, former president of the B. & O. Telegraph Company, is now the president of the Gibson Storage Battery, of New York. Meanwhile, his contract not having expired, he draws a very satisfactory income from the Western Union Company, the purchaser of the B. & O. Company.

Inquiries have been made as to the identity of the gentleman represented as entering the Electric Club in the picture from the *Scientific American*, published in the REVIEW last week, and the jaunty manner in which the gentleman carries his cane, locates him as Col. M. W. Goodyear, a former explorer of the Arctic Ocean.

It is not generally known among his electrical acquaintances, that Dr. Otto A. Moses is a well-informed Shakespearean scholar and an earnest advocate of the Bard of Avon as the author of the great work bearing his name. Mr. Donnelly, the discoverer of the so-called Baconian cipher, should look to his flint and steel, for the erudite Doctor may soon make known some new proof in support of the genuineness of Shakespeare's work.

Our esteemed monthly contemporary, the *Electrical Engineer*, of New York, very sensibly says:

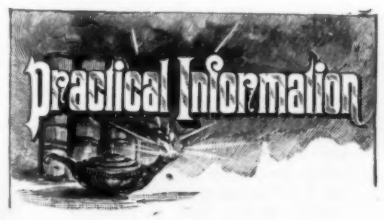
"It is to be hoped that the distinction between legitimate journalistic enterprise and vociferous buncombe, seasoned with unwarrantable brag, which is so little observed by some leading daily newspapers, will not be obliterated in the management of any technical journal.

"A circular recently issued by the publishers of an electrical periodical, which in many respects deserves and receives praise and support in electrical circles, savors too strongly, we regret to say, of disingenuous journalistic bluster. If reports are to be believed, the questionable circular led to an unseemly personal altercation at Pittsburgh, during the Electric Light Convention, between rival journalists. Why not leave the brag and bluster, brethren, to the quarreling dailies, and keep serenely in mind the constantly expanding field of electrical arts, in which there is likely to be room and verge enough for all to do good work and earn their money for some time to come."

The ELECTRICAL REVIEW has no respect for the "unwarrantable brag" and deception which composes the circular and predominates with the management so justly condemned above, and regrets that such un-American methods, in this day and in this progressive city, should be deemed necessary elements in sustaining any electrical journal.

Prof. Forbes' Meter.

Prof. Geo. Forbes, of London, will remain in the city some two weeks longer, making his headquarters at the Windsor. The new electric meter which this eminent electrician invented and perfected will be, we understand, used in this country by the Westinghouse Electric Company. This will be a valuable addition to the apparatus of this active and enterprising company.



An estimate places the number of persons supported by all forms of employment furnished by electricity at 5,000,000.

From various calculations it has been estimated that for the future we cannot reckon on more of solar radiation than 20,000,000 times the amount given out in a year, at present. Taking into consideration the gradually diminishing radiating surface, the conclusion has been arrived at that the sun cannot give out sufficient heat to support life on the earth after the lapse of 10,000,000 years.

Experiments made by the International Committee on the electrical appliances at the Antwerp Exhibition, show that the thermo pile, at least as constructed at present, is certainly not the source from which our power will in the future be obtained. Thus the pile exhibited by Messrs. Lantensack, Laske and Kohn, of Vienna, which was tested by the Committee, consumed coal at the rate of 836 lb. per horse-power per hour.

Mr. J. F. Waddington, of near Liverpool, England, a shipbuilder, is at work upon an electrical submarine vessel. Accumulators furnish the electricity. In the boat, two men can remain beneath the water's surface for six hours. The vessel apparently is easily controlled, but has not yet attained perfection in the eyes of the inventor, who is engaged in a number of improvements.

Notable Scientific Names and Practical Units.—In reply to a query the following is published: Michael Faraday (English), 1 Farad, unit of *capacity;* James Watt (English), 1 Watt, *activity;* James P. Joule (English), 1 Joule, *work;* Chas. A. Coulomb (French), 1 Couloumb, *quantity;* Andre M. Ampere (French), 1 Ampere, *current;* G. S. Ohm (German), 1 Ohm, *resistance;* Carl F. Gauss (German), 1 Gauss, *magnetic field;* Volta (Italian), 1 Volt, pressure. 1 Dyne is the unit of *force.* The strongest dynamo field is about 100 Gausses.

Electric Meters.—A correspondent writes for information relating to electric meters. At the present time there are two prominent meters for measuring electric current; one invented by Mr. Edison, and in regular use by his company; the other, quite recently, by Prof. Geo. Forbes, of England. The latter we have heretofore described at length. Mr. Edison employs a zinc voltmeter to measure the quantity of electricity delivered to each customer. Two zinc plates, an inch wide and three inches long, are placed in a jar and the bottle filled with zinc sulphate in solution. A small percentage of the current used passes through the cell from plate to plate, the remainder (about 999 thousandths) passing by a German silver shunt. The plates are weighed before placing in the cell, and are weighed again when calculation is to be made. The increase in weight of the negative plate, measured in Grammes, and divided by 1.2133, gives the quantity in Ampere hours which has passed through, and if the shunt ratio is known, then the total quantity passing through both is also known. A coil of copper wire is placed in series with the voltmeter, the resistance of which is such that the increase of its resistance with rise of temperature balances the decrease of resistance of the voltmeter, due to the same cause.

A time meter, in which a small wire extends to each lamp, was recently invented by Mr. Grove, now of Philadelphia. A time meter, somewhat on the principle of the gas meter, was announced among the inventions of Messrs. Sawyer and Man in the winter of 1878. Another new meter, not many miles from New York, may be expected soon.

The Electric Light Plant in the Equitable Building, New York.

The largest isolated incandescent electric light plant in the world was started some two weeks ago in the Equitable Building, 120 Broadway, and it is entirely proper that this, probably the finest business building in the world, should have so remarkable a plant. The building is wired for between 6,000 and 7,000 16 candle power incandescent lights, and the system used is that of the U. S. Electric Lighting Company.

The lamps are arranged on six main circuits, which are run vertically up the elevator shafts. The circuits are connected at their center to feeders which run back to the main switchboard in the dynamo room. These feeders consist of cables equal to 8 No. 0 wires in conductivity. From the vertical mains, branches are carried to the centers of distribution on each floor, from whence branches, carrying about 30 lights each, are led. The main branches are 00 wire, and the sub-branches No. 2 and No. 4, depending on the distance, number of lights, etc. All of the wiring is concealed under the plastering, and great care has been exercised in the insulation. The whole system of wiring is designed to carry 7,000 lights, with a fall in the potential of 2 per cent. with the full number of lights burning. This part of the work has been under the immediate supervision of Mr. Strong.

The engine room in the basement is in keeping with the rest of the building, the walls being finished with glazed tiling, and no expense has been spared to make it a model of neatness and convenience. A 28x60 Watts-Campbell Corliss engine, rated at 500 horse-power is the main source of power; and in addition to this, there is a 75 horse-power Armington & Sims engine for night work. The large engine is fitted with a fly-wheel 30 feet in diameter, weighing about 42,000 pounds. This wheel runs at a speed of 55 revolutions per minute, and by means of a 40-inch double belt, drives a jack-shaft, which in turn drives a line of 6-inch counter-shafting, 40 feet long, running at a speed of 340 revolutions per minute, and from this shaft are driven 7 600-light U. S. dynamos. These run at a speed of about 875 revolutions. The mains from the dynamos are all carried out of sight to a main switchboard, Fig. 3, where they connect to a common center. Each dynamo circuit is provided with a lever-switch and an ampere meter, so that the machines can be cut in and out of circuit at will, the ampere meter in each circuit showing the work which each dynamo is doing. There is also a rheostat in the field circuit of each dynamo for keeping the work distributed equally between the several machines. The switchboard is also provided with an automatic regulator and speed compensator connected with a main rheostat, which controls the fields of all the dynamos; and a potential indicator, which indicates so small a difference as one-tenth of a volt in the electromotive force.

In addition to the 7 600-light dynamos, is one dynamo, which is used for exciting the fields of all the others. This is connected with a two-way switch on the switch-board in such a manner that if it is desired all of the field circuits can be instantly

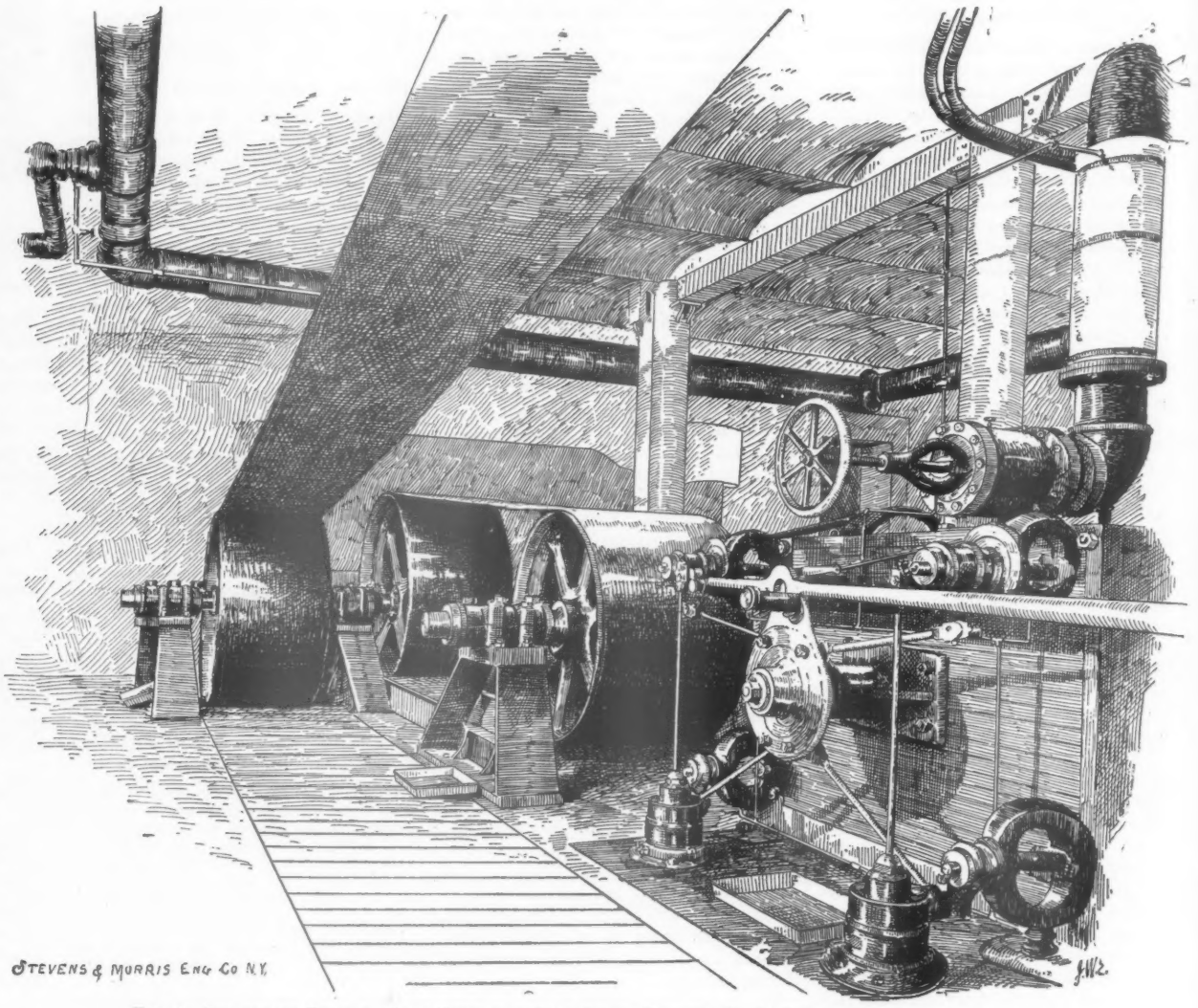


FIG. 2—SKETCH OF ENGINE, MAIN BELT AND JACK SHAFT DRIVING U. S. PLANT IN EQUITABLE BUILDING.

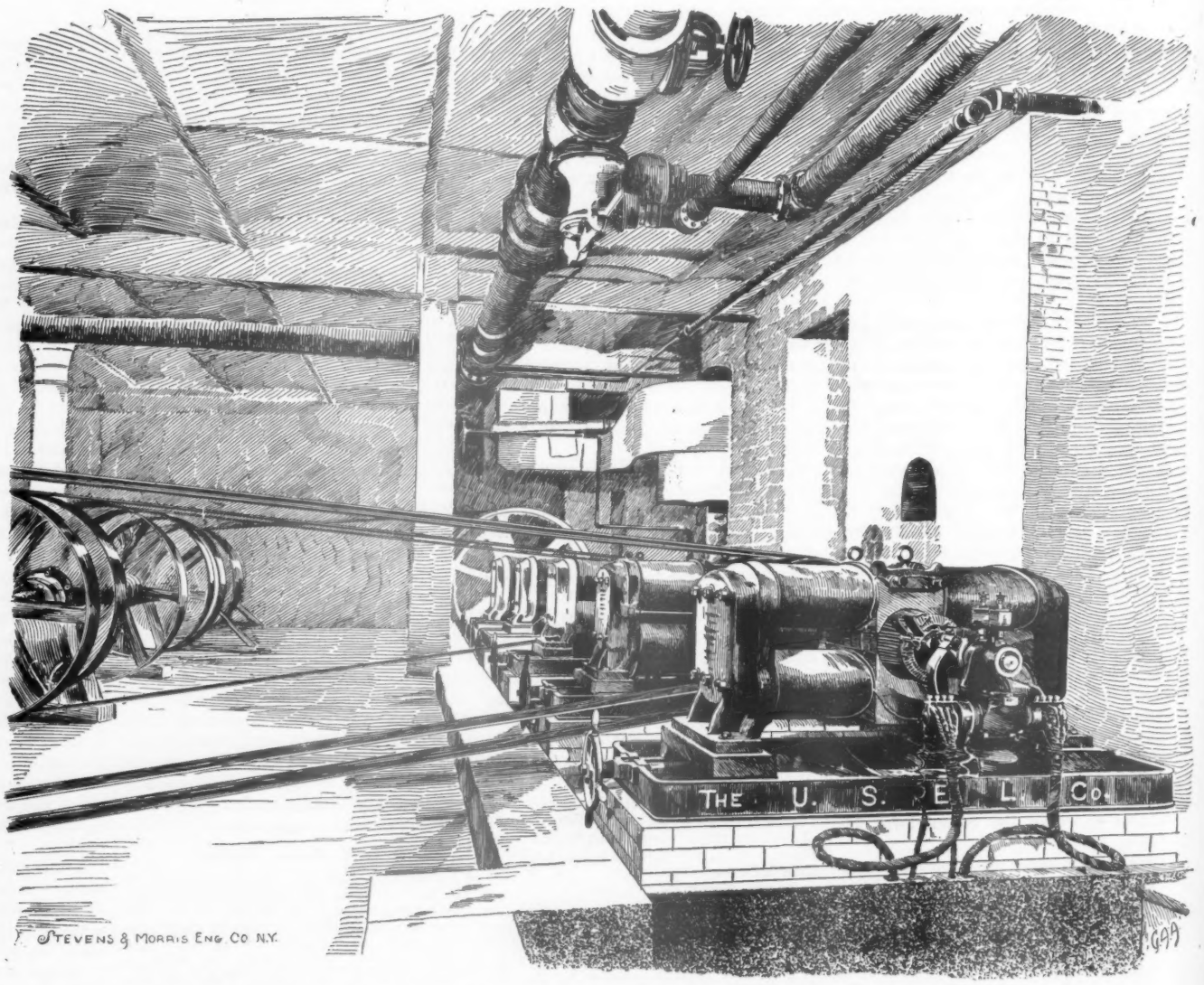


FIG. 1—SKETCH SHOWING LINE OF 600-LIGHT UNITED STATES DYNAMOS IN EQUITABLE BUILDING, NEW YORK.

connected and fed from the main circuit or from any desired dynamo instead of from the exciter. On the other side of the switchboard, is another two-way switch, which throws all of the circuits in the building on to a single machine. This is designed for night work. The general design and finish of the switchboard is elegant and ornamental, and a great credit to the United States Co.

The arrangement of the power plant was designed by Mr. Campbell of the United States Illuminating Co., subject to the approval of Mr. Wilson, chief engineer of the Equitable Building.

There are in the building a great many novelties in the way of fixtures of elegant design, notably in the cafe and restaurant and in the Lawyers' Downtown Club. Taking it altogether, we believe that there never has before been under one roof so varied and fine a display of electric lighting; and it is a pleasure for us to chronicle the successful starting of a plant which so forcibly shows the great advancement which has been made in these last few years in the workmanship, design and convenience in the operation of incandescent plants.

The visitor to the Equitable Building will be amply repaid by going into the basement and seeing the electric light plant; but in addition to this, there is a great deal more of interest there.

In the boiler room are 9 100 horse-power boilers, built especially for the building, designed by the engineer, Mr. Wilson, and fitted with many of his original ideas. All of the 10 passenger elevators in the building are run by hydraulic power, and the water for running them is pumped by a number of huge Worthington pumps, the heating of the entire building being done with the exhaust steam.

We understand that in the near future the United States Company is to have a large show room, also, in the basement, with engines running and so arranged that they can, at will, show machines of various styles in operation, and exhibit in the most practical way their numerous, interesting and valuable appliances.

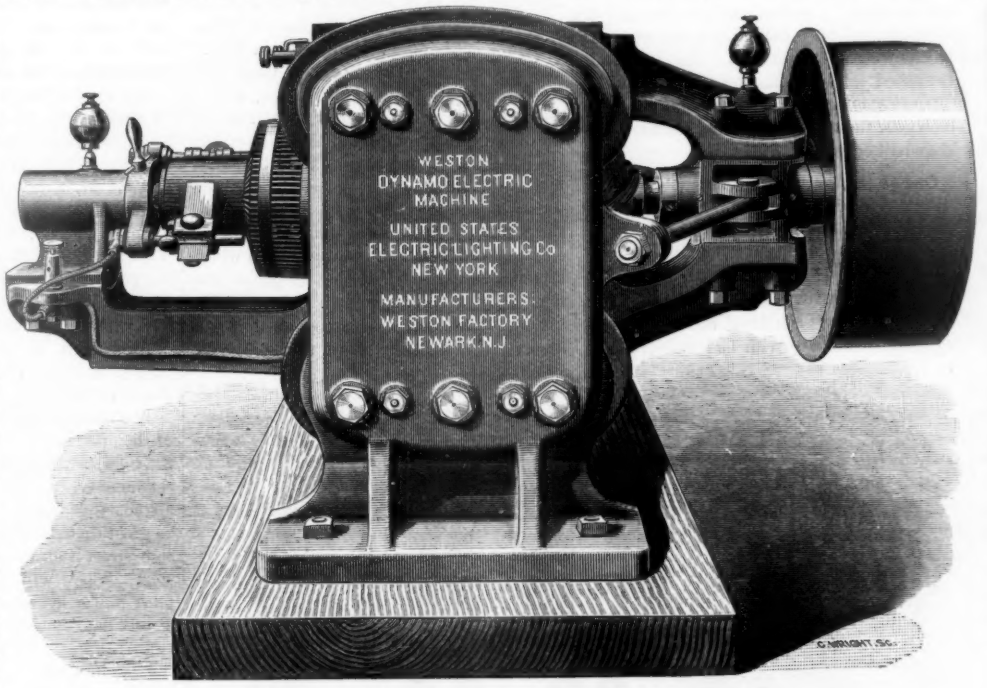


FIG. 5—U. S. DYNAMO USED IN EQUITABLE BUILDING.

FIG. 4—U. S. LAMP AND SOCKET USED IN EQUITABLE BUILDING.

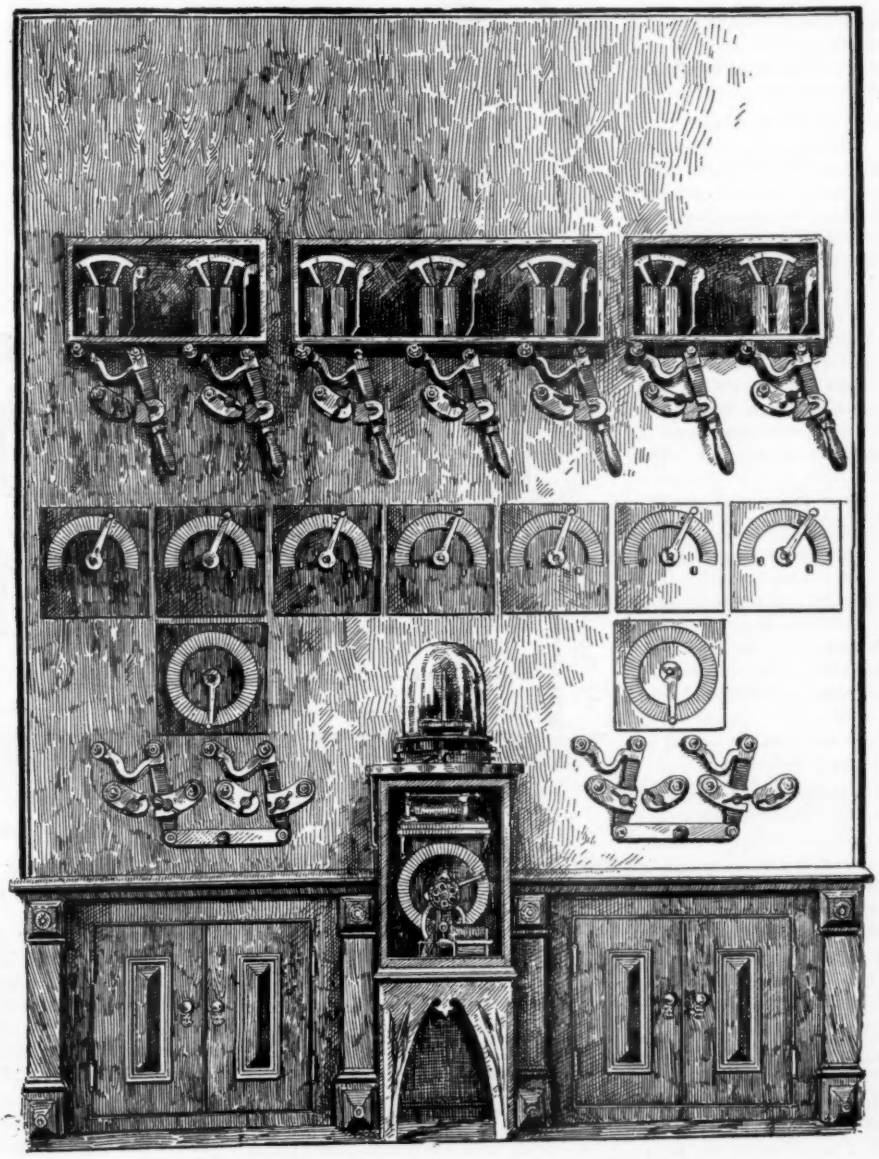


FIG. 3—SKETCH OF SWITCHBOARD OF U. S. PLANT IN THE EQUITABLE BUILDING.

.... The Herzog Teleseme System for police signalling has been on trial in the Nineteenth Precinct, New York, ever since last August, and the Police Commissioners have voted to adopt it for general use throughout the city. It is the invention of Mr. F. Benedict Herzog, an electric engineer, who was graduated from Columbia College with the degree of Ph. D. It is an elaboration of the hotel-telegraph system, whereby a guest by moving the needle on a dial in his room can send a message to the office indicating what he wants. The boxes now in use in the Nineteenth Precinct are slightly larger than the fire-alarm signal-boxes, and are simply experimental boxes.

TELEGRAPHIC

.... A stock company has been formed in England for the manufacture of annunciating bells with a capital of $50,000.

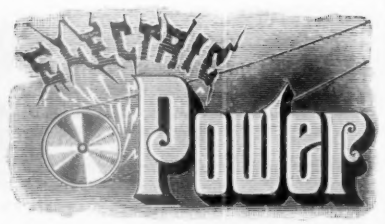
.... Two telegraph wires, each about six miles long, are to be laid in Spain expressly for studying earth currents and atmospheric electricity. The lines will cross each other at the astronomical observatory of San Fernando, one running due east and west, the other due north and south.

.... The United Lines Company has absorbed the Pacific Mutual Telegraph Company of the West, which has had its headquarters at Kansas City, Mo. The former officers, E. L. Martin, president, and Geo. M. Meyers, general superintendent, retire from their official positions.

.... Mr. L. S. Fairbanks, of Boston, has invented an induction coil, for which is claimed several decided virtues. It is designed as a current converter for electric light purposes, and for long distance talking by telephone. It has been tested and examined superficially by competent electricians, and is soon to be thoroughly tested.

.... The Dominion Telegraph Company, at Toronto, has elected the following directors and officers: Thomas Swinyard, Esq., Hon. Wm. Cayley, H. S. Northrop, Esq., Gen. Thos. T. Eckert, Hon. Frank Smith, Erastus Wiman, Esq., Alex. T. Fulton, Esq., Chas. A. Tinker, Esq., and A. G. Ramsay, Esq. At a subsequent meeting of the newly elected board, Mr. Swinyard was reappointed president, Mr. Cayley, vice-president of the company, and F. Roper, secretary.

.. A remarkable engineering feat has just been carried out in China in the face of unusual physical obstacles. This was the stretching of a steel cable of seven strands across the Lunann River by Mr. A. DeLinde, a Danish civil engineer, aided only by unskilled Chinese labor. The cable is strung from two points, 4,648 feet apart. The height of one support is 447 feet above the present level of the river, and the second support 737 feet above it. The vortex over the water is 78 feet. The Chinese cable, says *Indian Engineering*, is the longest but one in the world. The telegraph air cable across the Kistna has span of 5,070 feet; two similar cables across the Ganges, one 2,900 feet, and the other 2,830 feet. A third line of 1,135 feet crosses the Hoogly, and in the United States there is one over the Missouri of 2,000 feet



The Elieson electric motor, from England, is being tried in Buffalo.

Oswego, N. Y., is debating the matter of a change from horses to electric power for its street cars.

The North Baltimore Passenger Railway Company is experimenting with a storage battery motor.

The electric railway now being built in East Harrisburg, Pa., will soon be completed. Six cars will be in use at first.

The Rapid Transit Electric Railroad Company has been organized to introduce electric railways in Philadelphia. A route through the city has been calculated on.

The Washington Cable Electric Railway Company, Washington, D. C., has been organized, with a capital of $3,000,000. A. T. Britton and others, incorporators.

The People's Electric Street Railroad Company, Buffalo, N. Y., has been organized, with a capital stock of $50,000. Peter McNeil, and others, are the incorporators.

A very excellent motor is the one owned by the Elektron Company, of Brooklyn, with New York headquarters in the Potter Building, Nassau street side. It is well worth watching.

The Eddy Electric Manufacturing Company, Hartford, is meeting with much success in the introduction of its new electric motor. It is manufactured in all sizes, and is a compact, easy running motor that favorably impresses all who see it.

Nathan S. Keith, of San Francisco, Cal., has commenced an action in the United States Circuit Court against the Pacific Coast Electrical Construction Company and the Oakland Electric Light and Motor Company to restrain the defendant corporations from manufacturing and using a certain form of dynamo, of which he claims to be the inventor.

The C. & C. Motor Company, 90 South Fifth avenue, New York, has been compelled to enlarge its quarters and increase its staff of workmen, so great has been its business since the improvements were announced in the REVIEW some three months ago. The factory on South Fifth avenue presents a very busy scene indeed, and a great quantity of fine work is being turned out.

Wilmington's first electric street railway was opened to public travel March 5. The line is one and one-third miles long, extending from Tenth and Market streets to Riverview Cemetery. Cars are being run at twenty-minute intervals. The road is built on the Sprague system, with overhead wire and traveling trolley, a new feature being that the trolley runs on the under instead of the upper side of the trolley wires.

Capt. Griffin, of the engineer department, Washington, has returned from Boston, where he investigated the electric railway question. His report on the electric railway system is very long, and deals with the various electric systems now in use, and states that he is of the opinion that the system is practicable and useful. The report has been laid before the commissioners, who have as yet not considered it. It will be some time before it is made public.

Richmond, Va., asserts that she is the first city in the world to run, light, and heat a car by electricity. Its new patent heaters have just been put in operation. Four heaters were arranged in a series under the seats, having a radiating surface of 14 square feet and an electrical resistance of 198 ohms. A current, equivalent to one horse-power of energy, was obtained from the overhead wire, and though the day was cold and raw, the car was heated comfortably.

One of the striking features in the construction of the Capitol at Topeka, Kan., is the use of electric motors for handling heavy stones, masses of brick, mortar, etc. One of the motors is situated in the second story of the building. Another motor is attached to a traveling derrick, and easily handles granite blocks weighing eight tons. The current is furnished from the Edison circuits, and, as the power is only used at comparatively long intervals, the cost of operating the motors is but small compared with steam.

One of the car houses of the Observatory Hill Passenger Railway Company, Alleghany City, Pa., taking fire from some unknown cause, was entirely burnt down, Tuesday of last week, two of the new motor cars being destroyed with it. These cars had just arrived, and had been fitted up by the Bentley-Knight Company with Thomson-Houston motors, and would have been running on the road the next day, making four cars in service on the road. The other cars are running, and two more will be sent over as soon as they can be constructed. The disaster is very annoying, coming just at a time that the work was so near completion. This is the road that was visited by a number of electric light men during the last convention.

The New York office of the Baxter Motor Company, Potter Building, is in the charge of Mr. T. McCoubray. A very large business has been worked up in this city already, and a number of orders are being filled this week, among them, a two horse-power motor for Schenk & Schlichte, paper box men; the Gardner & Vail laundry, 773 Broadway (to be seen in the window); Dorlon's restaurant on 23d street; Geo. S. Bracher, 166 Greene street, replacing steam. The Danbury Printing Company, of Danbury, Conn., has ordered a horse-power motor, for running its printing presses.

Who is this Telephonic Chesterfield?

The charming young women employed at the Central Telephone office, John street, New York, have made a discovery. There are some fifty of these girls who sit with the receivers clamped to their ears shouting "Hello!" "Louder!" "Can't hear you!" all the day long. The discovery these girls have made, says the New York *Sun*, is of a young person who is a perfect Chesterfield in the distinguished courtesy of his manners over the telephone. They do not know his name, but know that he is engaged in business somewhere in that busy leather village called the Swamp. It was some time ago that the elegance and exquisite courtesy with which this individual handled the telephone was noticed by the young women.

Confidences were exchanged until it was discovered that nearly all of the girls who had responded to his ring had been struck by this exceptional case of sweet savored courtesy.

The young man never flirts or chuckles over the telephone, and his conversation is confined to business entirely. But it is a delight for the girls to answer his call. He is now known as the Swamp Angel, and has an individuality as distinct and positive as Roscoe Conkling's would be if he was the manager in that office.

The Swamp Angel's ring is peculiar, and the girls know it. It is a gentle, persuasive tintinnabulation, and fortunate is that young woman regarded whose duty it is to respond. They say that they perceive, though they cannot see, that the young man bows exquisitely as he speaks to the operator, and his voice carried over the wire is soft, sweet and gracious.

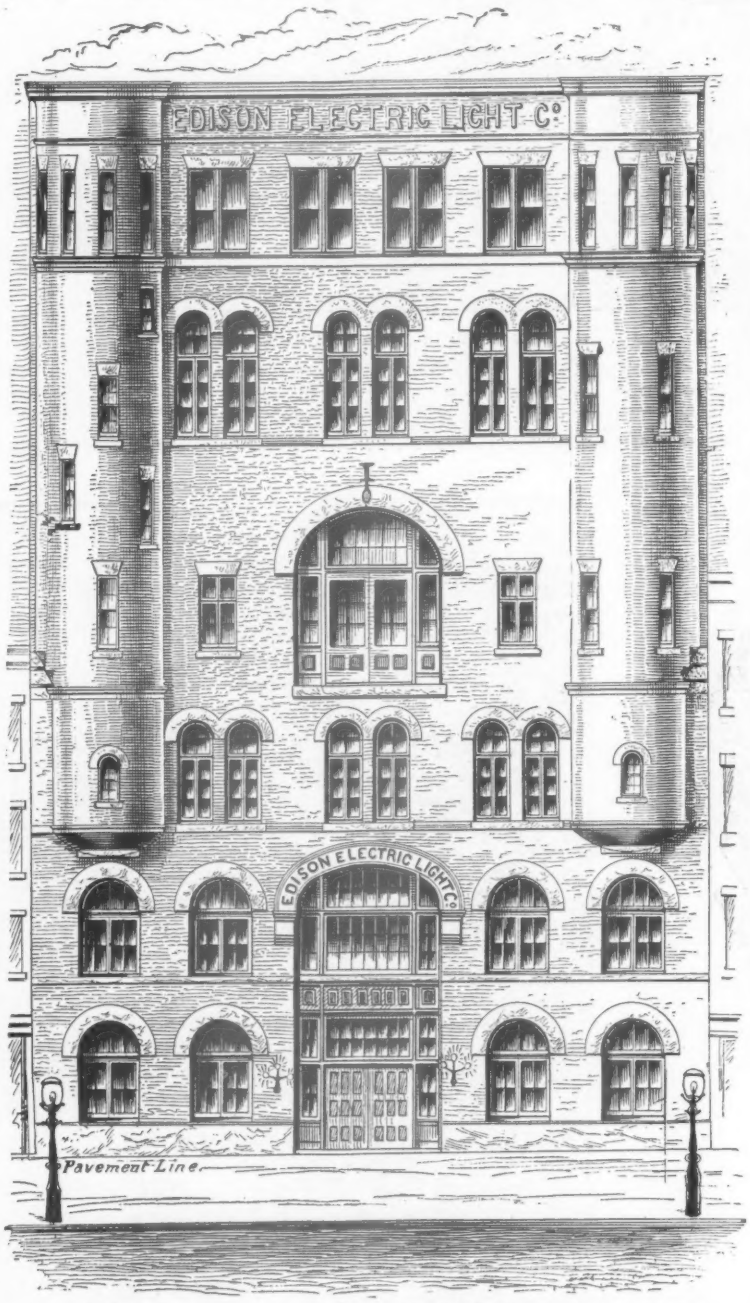


FIG. 1—VIEW OF FRONT OF THE NEW EDISON BUILDING IN PHILADELPHIA.

The Edison Philadelphia Plant.

The Edison Electric Light Company is completing a splendid building in the city of Philadelphia, to be used as a generating station and general office building. A view of the Sansom street front is given, and also a sectional view of the interior arrangement. The men who are behind this enterprise are well known in financial and business circles of Philadelphia, and they are represented by the following board of directors: B. K. Jamison, Amos R. Little, Samuel B. Huey, Charles M. Swain, Thomas M. Thompson, John Lucas, D. S. Lindsay. Mr. E. H. Johnson and H. Blake Tyler are the New York directors. The scientific and engineering part of this work is under the supervision of Prof. William D. Marks, of the University of Pennsylvania. The architects are Wilson Bros. & Co., Philadelphia. The capital stock is at present $1,000,000, in shares of $100 each.

The construction of the building is to be of the most massive kind, made necessary by the interior arrangement, as indicated in the sectional view, Fig. 2. It is stated that already the demand for the electric light is so great that the full resources of the Sansom street station will be employed at the start. There will always be 25 per cent. more power in the plant than will be needed at any one time, thus assuring an uninterrupted supply of light even if four or five of the engines and dynamos break down at once—an accident that will be practically impossible. The station will be so arranged that there will be little difficulty in increasing its 5,000 horse-power to 7,500, as required to supply additional demands.

But great as it will be, this plant is only the beginning of the plans of the company. It will supply only the central portion of the city, and it is expected that other stations nearly, if not quite as large, will be erected in different parts of the city.

—— The use of the Lykens Valley Coal Company's electric locomotive is attracting much attention among mining men. What is wanted in the mines is an economical storage battery motor that can go where it would be difficult to maintain conductors. By some means the use of electricity for underground haulage is certain to receive a very wide application in mines.

—— The Hudson (N. Y.) Electric Light Company, to supply electric light and power to the City of Hudson, Columbia county, is incorporated, with a capital of $90,000, divided into 1,800 shares. The trustees are: A. W. Rice, Theodore A. Boynton, Frederick J. Collier, Cornelius H. Evans, Crawford E. Fritts, James B. McGiffert, F. E. Rice, Edwin C. Rowley, and N. H. Browning.

—— A new dynamo has been constructed by Prof. James J. Wood, the electrician of the American Electric Manufacturing Company. Its weight is 3,800 pounds, and Prof. Wood states, will run from 75 to 85 arc lamps, according to length of circuit. During the visit of a reporter to the factory it was overloaded by placing 95 lamps in circuit, without any apparent diminution in the brilliancy of the individual lamps, though of course they must have given less candle-power than the 1,200 nominal for which the machine was constructed. Mr. Wood, in order to illustrate the range of the machine's capacity, then directed his assistants to turn off the lights, 5 at a time, then 10 at a time, and then 25 at a time, until all save 1 were turned off. This was repeated several times—turning off and on—without any perceptible change of power of the single lamp that remained burning. The dynamo was then placed on short circuit, or all lights off, without danger from overheating, there being little or no sparking at the commutator, so perfect was the operation of the regulator. The lights were then rapidly turned on, the regulator responding instantly as the number of lights were increased, until the load was again at a maximum. The experiment not only showed the capacity of the dynamo, but the completeness with which the regulator held the dynamo under control, increasing or decreasing the power as the occasion called for it.

The Electric Club of New York.

The London *Engineering*, of February 24, contains the following interesting mention of the new Electric Club organized in this city:

"The peculiar position of this organization, composed of persons interested in the many scientific or commercial applications of electricity combining the features of a social club with those of an important educational institution, has already received mention in our columns.

"The accessions to membership, and the absolute need of more room for library and lectures, made it imperatively necessary for the club to obtain larger quarters, and therefore they purchased a large dwelling in a favorable locality near to Madison Square, New York, which has been completely changed inside to fit it for the peculiar needs of the club. On the 31st of January it was the scene of a brilliant gathering of members and invited guests assembled at the 'housewarming,' or inauguration of the building. The formal exercises were short, consisting of an address by President Henry C. Davis, whose remarks were devoted to a consideration of the necessity of the club to avail itself of its present facilities in fostering electrical progress, saying, 'We have a work, worthy of our highest ambitions, to accomplish. The progress of electrical science, and its rapidly increasing application to the commercial interests of the world, demand an organization that, while fostering the social element, will also furnish technical, scientific, and educational advantages—an institution that will give the facilities of the museum, laboratory, library and lecture room; the museum with its milestones of progress, that should be carefully guarded and handed down to posterity; the laboratory, with its corps of investigators, not to report this as better than that, but one capable of giving results, which will be accepted as authority; the library and lecture room, for those thirsting for a higher plane of intelligence.' He was followed by Professor H. A. Rowland, of John Hopkins University of Baltimore, who delivered an address on the 'Electrical and Magnetic Discoveries of Faraday.' The paper lost none of its interest by its cyclopædiac character; the fact that it did not follow the conventional type of dissertation usually offered on such occasions, gave it special attractions, for the theme of the great natural philosopher's methods and results can always be edifying to those engaged in applications of science.

"The building is elegantly furnished, and electricity has been appropriately used in many novel applications. When one approaches the street door, instead of using the bell-pull, the visitor by pressing his foot upon a metal plate rings an electric bell, and the door is unlocked by electricity and opens at once.

"The illumination of the building is wholly by incandescence lamps, mounted upon elaborate electroliers which are designed especially for the purpose, containing features which could not be used in gas fixtures, where the position of the light must be considered so as to be free from interference directly above the flame. There are some 350 lights in the building, which are maintained by dynamos and secondary batteries situated with the engine in a building to the rear of the club house. * * *

"The club has a growing library, accessions to which in the form of electrical books inscribed by the author, are particularly desired.

"Sir William Thomson and other Englishmen responded to the invitation with regrets, except Professor George Forbes, F. R. S., whose arrival the day before permitted a personal acceptance.

"The influence of such an organization is most salutary, for in addition to its educational features it brings together business and professional rivals who are naturally opposed to each other in the antagonism fostered by sharp competition of great rival interests, but within these walls they adhere to the Shakesperian maxim, 'Do as adversaries do at law, strive mightily, but eat and drink as friends.'"

Electric Lighting to have a Better Show in England.

The electric lighting act is being discussed in the House of Lords, London. Several speakers referred to America as leading the way. Baron Herschel went so far as to say that England was behind even the South Sea Islands. Parliament, not wishing to allow further great monopolies like the water-gas companies, inserted a clause in the bill of 1882, compelling the electric companies to transfer their plant to the public authorities after 21 years at the valuation. Capitalists consider that period not long enough to compensate for the risk. The amended bill now before the House will certainly be passed, and the companies will then be allowed 42 instead of 21 years.

—— Winchester (Mass.) is shortly to have electric light. A company is being organized.

—— The Pawtucket (R. I.) Gas Company has purchased the electric light plant in that place.

—— The New England Glass Works will soon move into a large new factory at Toledo, Ohio.

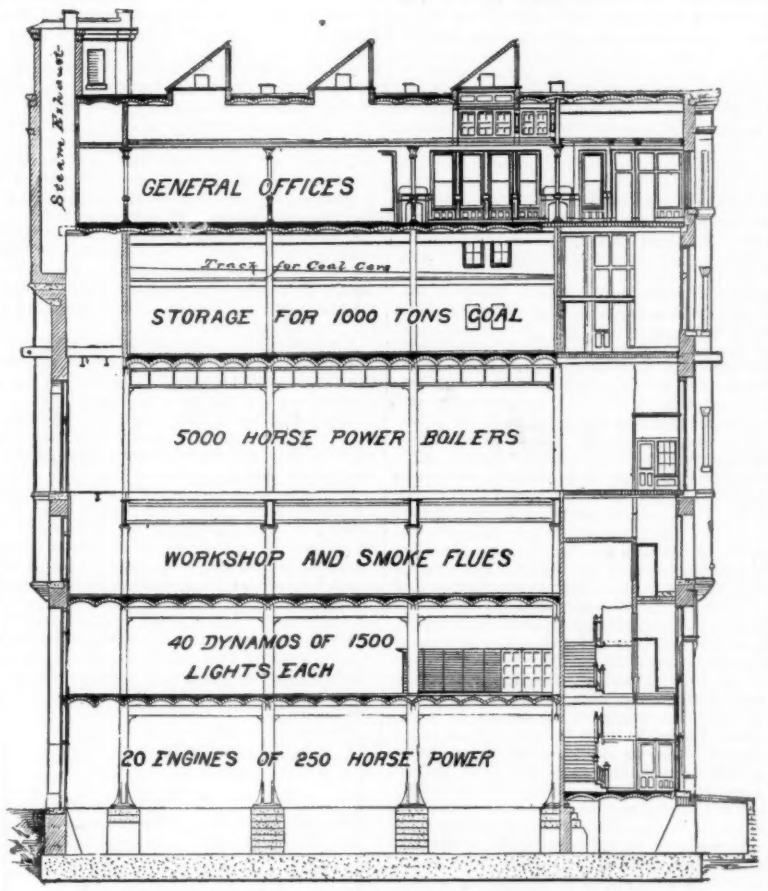

Steam Exhaust
GENERAL OFFICES
Track for Coal Cars
STORAGE FOR 1000 TONS COAL
5000 HORSE POWER BOILERS
WORKSHOP AND SMOKE FLUES
40 DYNAMOS OF 1500 LIGHTS EACH
20 ENGINES OF 250 HORSE POWER

FIG. 2—SECTIONAL VIEW OF THE PHILADELPHIA EDISON BUILDING.

—— At Springfield (Mass.) the United Electric Light Company have increased their capital to $150,000, an increase of $40,000.

—— C. A. Coffingwell has been awarded the contract for lighting Shreveport, La., with electric light for the next three years. He should furnish lighting well.

—— The New Bedford (Mass.) Gas Light Company contemplates the issue of $75,000 new stock, and will purchase the plant of the New Bedford Electric Lighting Company.

—— The Baltimore and Ohio Railroad Company put in a plant for the electric light at Grafton, Va., in connection with its machine shops and yard, and the light was turned on for the first time last week, and works very satisfactorily.

—— At Braddock, Pa., an interesting fight is going on between the companies representing the Westinghouse and Edison electric light systems. The Westinghouse people have the right of way through the borough, while the Edison people are asking council for the privilege to come in.

—— The Consolidated Electric Light Company, Portland, Me., is adding to its steam plant, and has just placed an order for a 90 horse-power Armington & Sims engine, and setting a new 6 foot boiler on the Jarvis setting. It now has 5 large boilers on this plan and has 8 Armington & Sims engines.

—— Bucksport, Me., now seems certain to have the electric light. Mr. George H. Grant, of Bar Harbor, has hired the old steam mill belonging to Edward Genn, and will put in a dynamo there which will light the town thoroughly. It is thought that a large number of lights will be taken in the town.

—— Considerable progress is being made by workmen in the erection of poles for the electric light wires from the company's works at East Riverside, California. The lines have been completed from the works to San Bernardino and Colton, and the company expect to soon be in readiness to supply our people with all the light they want.

—— After a long contest the Thomson-Houston Electric Light Company has secured control of the Cambridge (Mass.) Electric Lighting plant. The plant will continue to be operated under the management of a board of directors composed of Cambridge gentlemen, including, probably, several of the present directors.

—— The suit of B. H. Blome, before Justice Guentz, against the Electric Light Company, of Belleville, Ill., for $200 damages, in consequence of his horse scaring at an electric light wire which was down, and running off, thereby wrecking his wagon, resulted in a verdict in favor of the Electric Light Company.

—— A Toledo exchange advances as the claim of the gas people in response to a protest against poor gas, that the gas is as good as ever, but that the advent of electric lights has put the gas in the shade, and that the contrast is so great, people think that the gas is poorer. However that may be, residents on a street lighted by electric lights are using more gas in their houses than they ever did before, and the last theory may contain more truth than poetry.

—— The Babcock & Wilcox Company have placed a very large number of their boilers since January 1st, and a number of electric lighting companies were purchasers. Among them were the Alleghany County Light Co., Pittsburgh; Edison-Swan United Electric Light Co., London; Royalty Theatre, Glasgow; Rochester Electric Light Co., Rochester, Eng. This would indicate that these standard boilers are not only widely known at home, but foreign countries are awake to the advantages of the goods of American manufacturers.

ELECTRIC LIGHT NEWS

—— Merrimac, Mass., is arranging for a Thomson-Houston electric light plant.

—— An electric light plant will soon be established at Haskell Institute, the Indian school at Lawrence, Kan.

—— Grand Junction, Col., is soon to have an electric light plant. The plant is to have a capacity of 600 lights to begin with.

—— The United States Electric Company have completed their large factory at Newark, N. J. It is 135x135 and four stories high.

—— Electric light wires and poles are now being placed in the streets of Arlington, Mass., by the Somerville Electric Lighting Company.

—— The Galveston (Texas) Gas Company has purchased the Brush Electric Light and Power Company, and will hereafter furnish both illuminants.

—— The electric lights were turned on at Herrington, Kan., on the night of February 15. This is the youngest city in the State, and probably in the world, lighted by electricity.

—— Mr. M. D. Mather, of Austin, Texas, travelled several miles to attend the Electric Light Convention, yet he felt so well repaid that New York will probably see him at the next one.

—— The Hartford Electric Light Company have elected as directors A. C. Dunham, William H. Bulkeley, H. M. French, T. O. Enders, W. O. Burr, William H. Goodrich, Leverett Brainard, Henry Roberts, Atwood Collins.

—— Kyoshi Sawai, of Tokio, Japan, unless he had passes, paid more railroad and steamship fare than any other attendant at the recent Electric Light Convention. He is on a tour of study and investigation, and of course met with much that was instructive among the electric light men.

—— The business of the electric light company, of Pueblo, Col., has increased so rapidly that it has decided to double its capacity, which is the second time that little operation has been necessitated. A 100 horse-power engine has been ordered with dynamos, and all other necessary apparatus.

—— Lansing, Mich., has had some skirmishing committees running round the country trying to find out what other people pay for electric lighting. If the Lansing electrical aldermen only took even one copy of the REVIEW, they might be kept posted very cheaply, but there wouldn't be so much fun, perhaps, in that way of getting information. Alderman Shank, at the Business Men's Meeting, read the report of the E. L. Committee. It showed that Jackson paid 2.05 cents per hour, Bay City, 2.33 per hour, while Lansing was paying 4.55 cents per hour. The report was adopted, and a resolution asking that better figures be arranged for was adopted.

—— The Narragansett Electric Lighting Company, Providence, has just put in position a new 200 horse-power Armington & Sims engine. This engine which will be run at about 165 revolutions per minute, will be belted direct to four dynamos and will be used in the street lighting circuits. The company is putting in a considerable amount of new work, including both arc and incandescent lights in series on arc light circuits. Of what is known as straight work, a good example may be seen at the company's station, where, on an arc light line run down the center of the ceiling, are incandescent lamps of 120, 65, and 38 C. P., and an arc light could be cut in and run on the same current without affecting the other lights. This enables the company to give a mixed service in stores to suit the varying requirements of show window or desk illumination.

ELECTRICAL AND SCIENTIFIC

About Alternating Currents.

No question discussed by the recent congress of electric light men, in Pittsburgh, brought out deeper or more enthusiastic interest than that of alternating currents. A delegate had only to allude to this branch of electric lighting to start a warm and earnest discussion. The "Energy of Alternating Currents," as presented by Mr. O. B. Shallenberger, the electrician of the Westinghouse Electric Company, was most attentively listened to, and proved a valuable addition to the literature of this newly developed branch of electric lighting. A summary of the points made in this paper appeared in the REVIEW three weeks ago, and in this issue we present at length the paper with the only correct drawings illustrating the principle brought forward by the author that have yet appeared.

In his opening, Mr. Shallenberger says:

It is not proposed to enter into a mathematical discussion, but rather to offer a few illustrations and examples which will assist in a general understanding of the subject, and at the same time prove the uncertainty of the well-known rules for direct currents, when generally applied to alternating currents. Under certain well defined conditions such methods may be employed without sensible error, and, fortunately for the electric lighting industry, these conditions are naturally present in the exact kind of apparatus necessary for the simple and economical distribution of the alternating current.

In estimating the amount of energy expended in a circuit traversed by a direct or continuous current we are accustomed to base the calculation on measurements of the difference of potential between the two points of the circuit in question, and at the same time, the current traversing that circuit. The product of these two quantities, as is well known, gives a correct measure of the energy of the circuit expressed in watts. This method may or may not be applicable to alternating currents, the distinction depending upon the presence or absence of self-induction in the circuit. In the case of a straight copper wire going out from the source of current and turned back on itself in close proximity, it may be assumed that self-induction is practically absent, and hence no sensible error would be involved in taking the product of the difference of potential between any two points, as measured on a Cardew voltmeter, and the current traversing that portion of the circuit as determined by a Siemen's dynamometer, and then using these two factors in the product which represents the amount of work done. This would give a correct result; but the introduction of a coil of wire wound in one direction, especially when it surrounds an iron core, greatly modifies the conditions, and causes an error, the amount of which is dependent on the form and size of the coil. The reason for this is that the additional element of self-induction has been introduced, with consequent retardation of the phases of current. This simply means that, as the difference of potential alternately rises and falls and reverses its polarity, the corresponding fluctuations of current do not occur at corresponding instants of time. The want of synchronism may be of any amount between zero and a quarter of a complete wave length. When there is no self-induction present in the circuit, there is no displacement, but a departure from this relative position may be produced by introducing self-induction into the circuit, and to a point which may, theoretically, cause waves of current to lag a quarter of one complete alternation behind the waves of the electro-motive force, although it is impossible to realize this amount in practice.

Let us inquire now what is the effect of this displacement on the amount of energy expended in the circuit; but as a preliminary step it will be well to examine the case of a secondary battery which is being charged from a suitable direct current generator. Suppose first, that current is supplied from the generator with a sufficient electro-motive force to overcome the counter electro-motive force of the cells and produce a certain flow of current. We may introduce into the circuit a suitable ammeter to determine its amount, and connect across the circuit a voltmeter, and by the product of the indications of these two instruments we obtain a result which shows the expenditure of energy at that time. But if, later in the process of charging, the speed of the generator is reduced to such a point that the counter electro-motive force of the battery is sufficient to overcome the electro-motive force of the generator, and cause a flow of current in the opposite direction, it is well understood that the battery would no longer be charging, but would be running the dynamo as a motor, and consequently expending energy upon it. If the resistances of the armature and battery are low, the readings of the voltmeter and ammeter might be exactly the same as in the former case, and the product of these two factors would of course show the same amount of work done. In the absence of any other information than the readings of these instruments, it would be impossible to judge whether work was being done by the generator on the battery, or by the battery on the generator. Another element requires consideration, and that is the direction of the current as related to the difference of potential across the circuit. Referring to Diagram 1, a generator is shown at G supplying current to charge a battery at B. Let it be assumed that the electro-motive force of the generator is in such a direction as to make the upper conductor positive with relation to the lower. Calling this a positive electro-motive force, a current in the direction of the full arrow would be positive, and one in the direction of the dotted arrow would be negative. Whenever the generator is doing work on the battery the current flows from the positive to the negative conductor through the battery, or in the direction in which the generator tends to deliver the current. If we had called the electro-motive force of the generator negative, this would be a negative current. We can assume either, but in each case the current and electro-motive force have the same sign. When, however, the electro-motive force of the generator falls sufficiently to allow that of the battery to overcome it and send a current in the opposite direction, as shown by the dotted arrow, the conditions are reversed; that is, the battery is doing work on the generator and driving it as a motor, but without the polarity of the external circuit being changed. We now have a positive electro-motive force, a negative current in the battery, and work done by the battery on the rest of the circuit.

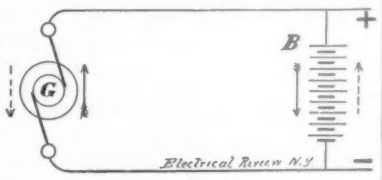


DIAGRAM 1.

The foregoing is only an illustration of the general law that when the difference of potential between two points on an electrical circuit is of the same sign as the current traversing it, work is being expended in that portion of the circuit; and conversely, if they are of opposite signs, work is being restored by that part of the circuit. It is therefore necessary to know the relative polarities of the current and electro-motive force as well as their amounts, in order to have a complete knowledge of the energy of a circuit. The same thing is true for an alternating current; that is, we must know whether the instantaneous values of electro-motive force and current have the same sign, as well as the values themselves; and this can only be the case where no self-induction is present, or in the practically equivalent case in which the self-induction is so nearly neutralized as to be of no relative importance.

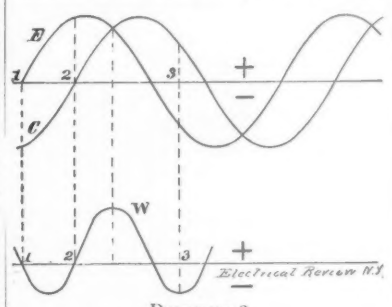


DIAGRAM 2.

Referring now to Diagram 2, there are shown two curves in the upper figure, E and C. E represents the phase of electro-motive force of an alternating generator, and C the corresponding current through a circuit possesssing a certain amount of self-induction. Distances along the horizontal line are taken, as usual, to represent successive periods of time, and the relative amounts of current or electro-motive force are represented by the vertical distance above or below this line, those above being called positive, and those below negative. It will be seen, on inspection of the figure, that at the instan, shown at 1, the electro-motive force is zero, while at the same time the current has a considerable negative value. Again, at the point 2 the current falls to zero, while the electro-motive force has risen to the amount shown by the vertical line at 2. At 3 we have an instant at which the current and electro-motive force are of opposite sign. Here we have three distinct cases, in the first two of which no work is being done, and in the third, work is being done by the circuit on the generator; but in each case an effect would be produced on the instruments used for the measurements of electro-motive force and current. In fact, taking independent continuous measurements of the electro-motive force and current, it is quite evident that the same results would be obtained without regard to the time relation of the phases, as long as the form of each remains unchanged; and for this reason the result would be the same from such measurements whether the curves were coincident in time, and the current curve occupied the same position as the curve E, or were displaced as shown in the diagram. In the former case, as there is no displacement of phase, the products of current and electro-motive force at each instant would be positive; that is, work would be done at each instant upon the external circuit except when passing through the values of zero.

The effect of the displacement of the current phase is shown in the lower figure, where a curve is drawn to show the phase of work done at each instant of time when the lag of the current phase is of the amount here represented. At 1 no work is being done, since the product of E and C contains a zero factor. Between 1 and 2 we have work done by the coil, since the electro-motive force is positive at the same time that the current is negative. Then we have a period in which work is expended by the generator: and then at 3 again work is restored by the circuit to the generator. By still further displacing the current phase the amount of work restored to the generator may be greatly increased. The example I have taken, a retardation of about one-sixth of the phase length, is a very moderate one, and easily realized in practice, and yet the amount of energy restored to the circuit in work done by the coil is nearly one-fourth of the apparent amount of energy expended, as shown by the product of current and electro-motive force. The diagrams are not intended to show the exact forms of current phase, or of the phase of work done, but they are sufficiently near average conditions for purposes of illustration.

A retardation of one-fifth of the phase restores about one-third the apparent energy to the circuit, and beyond this point, the proportion restored increases in a high ratio.

The actual work done can never be more than the product of current and electro-motive force, and may easily be only a small fraction of that amount.

To show that this retardation is not an imaginary thing, but may have a very decided influence on actual measurements, I will describe two experiments which show phenomena that can be accounted for in no other way, or, at least, cannot be explained by the ordinary rules of direct current measurement. An experiment by the writer, similar to the second of these, was described by Mr. Stanley in a paper before the New York Society of Engineers some weeks ago, and is still another example of the same phenomenon.

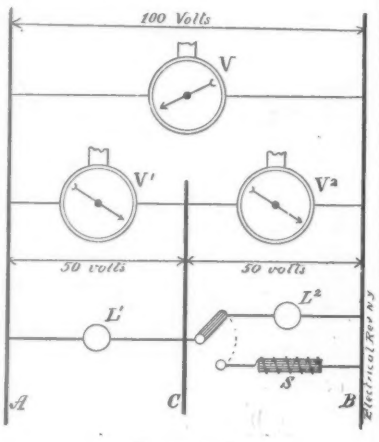


DIAGRAM 3.

In Fig. 3, two conductors, A and B, are shown, between which an alternating difference of potential of 100 volts is maintained, and indicated on the Cardew voltmeter V. Between these two conductors a third, C, is placed, and two Cardew voltmeters, V^1 and V^2, are connected across the two circuits, and show by the sum of their readings the difference of potential between A and B. They should, under ordinary conditions, agree with the reading of the one at V. Between A and C is connected an incandescent lamp L^1, and between C and B, through a switch d, the circuit may be closed either through the lamp L^2 or through a coil of wire S, which surrounds a soft iron core. With the connections, as shown in the diagram, that is, with the switch connected to the lamp L^2, a perfect balance is obtained, and by adjusting the difference of potential between A and B to 100 volts, we obtain readings of 50 volts on each of the voltmeters V^1 and V^2. If, however, the switch d be transferred to the point which connects it with the coil S, a somewhat remarkable effect is observed. The readings of the voltmeters at V and V^1 remain constant, since the coil has been so proportioned by trial as to exactly replace the lamp L^2 and maintain L^1 at exactly the same degree of luminosity; but the voltmeter V^2, instead of remaining constant in its indication, as might have been supposed, increases its indication to 80 volts, so that we have our choice, so to speak, of two measures of the difference of potential between the conductors A and B. These are of such large cross-section as to be of sensibly the same difference of potential throughout their length. Measuring at V we have 100 volts as before, but at V^1 and V^2 we have the sum of 50 and 80 or 130 volts. It is quite evident that there is some condition present, entirely remote from any which could be produced by the action of direct current; for it is absurd to suppose that at the same instant of time we can have two separate values for the difference of potential between the same two points. The natural inference seems that these measurements show in reality only the average of effects which occur successively, although they appear to be simultaneous.

When an impulse from the generator occurs, current flows through V^1 and V^2 instantaneously, and this would give a reading of 50 volts on each if acting alone; but the same impulse, acting through the coil S produces a current which, owing to the self-induction of the coil, lags behind the electro-motive force, and therefore the coil must restore work to the circuit at some point in the phase. This work is partly expended in the voltmeter connected to the coil, and for this reason it gives a higher reading than the other.

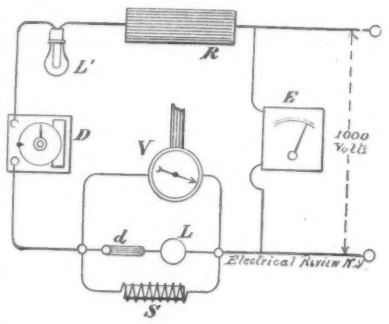


DIAGRAM 4.

Figure 4 shows a second arrangement in which the current is indicated by a Siemens dynamometer D, and the difference of potential is maintained constant by the electrometer E. The current may be adjusted to the proper amount by means of the resistance R, introduced in the circuit. An incandescent lamp L^1, is also placed in the circuit in series with the dynamometer, to indicate to the eye any fluctuations in the current. At L, a similar lamp is placed, and around its terminals is shunted a properly proportioned coil S, surrounding an iron core. A Cardew voltmeter V, is connected at the same points to show the difference of potential. With the switch d closed, the normal current passes through the lamp L, and a difference of potential of 50 volts is shown on the voltmeter V. The dynamometer shows $1\frac{6}{10}$ amperes to be passing through the circuit, and the electro-meter indicates 1,000 volts. On opening the switch d, a slight increase of current is shown by the dynamometer D, while the difference of potential at E is constant. The only change in the arrangement of the circuit is that the current instead of passing through the lamp L, and the coil in parallel, now passes through the coil alone, and yet, instead of 50 volts, the voltmeter now indicates 148 volts; so that we apparently have 98 volts more in the circuit without noticeably changing the difference of potential at the terminals, and without sensibly changing the current; or, to look at it in another way, we have, under a constant potential at the extremities of the circuit, introduced an apparent resistance, and at the same time increased the current traversing the circuit. We have here a case similar to the former one, and as the explanation is much the same, it need not be repeated.

The question naturally arises, what influence does this new element of self-induction have upon the possibilities of practical measurements of the alternating current in commercial work? As was stated in the beginning, the practical effect is almost negligible, for there are two cases in which the time element enters to such a limited extent, if at all, that the measurements may be made with perfect success in precisely the same way as if direct currents were employed. These are, first, the measurement of current through an incandescent lamp supplied by an alternating current directly from the generator; and second, the current supplied to lamps through the medium of converters with cores far below saturation and carrying a fair proportion of their full normal load. There is a third case, however,

which arises in practical work, in which the central station instruments give a somewhat false notion of the actual energy being transferred to the circuits, and this is the one in which a large number of converters are connected to the primary circuit but with the secondaries open. In this case the effect of self-induction is at its maximum, and there is, consequently, a lag in the current, which, in a well-constructed converter, approaches the theoretical limit of a quarter phase; at which point no energy would be consumed, while at the same time a considerable reading might be shown on the current instruments. This apparent difficulty is not a real one, since even the full amount of current shown by the ammeter only constitutes a small percentage of the total output of the plant, and may practically be neglected. Even a small number of lamps in service distributed among the converters greatly reduces this error, and for this reason, even while running with a light load, the ammeter at the central station very nearly corresponds to the number of lights in the service; while at full load the reading is as accurate as if the current passed directly from the generator to the lamps.

It ought to be evident, however, from what has been shown, that the method which has sometimes been adopted, of turning off all the lamps from the secondary circuit, leaving the primary connected to the generator, to show the amount of energy lost in conversion, is apt to give very misleading results unless the proper correction for retardation is applied.

The best proof of economy in the use of converters is that a test of the power expended in running a dynamo at its normal electro-motive force, with its circuit closed through the primary coils of its full complement of converters is the same as when the primary circuit is entirely open, within the ordinary limits of error of measurement.

New York Telephone Investigation.

On the 27th day of April, 1887, the Assembly of New York State passed a resolution directing the appointment of a Committee charged with the duty of ascertaining the names of all companies doing telephonic business within the State of New York, the amount of the capital stock of each, the cost of the plant and operation, the amount of the earnings of each of said companies, and the dividends paid by them. The Speaker appointed as such committee Messrs. Ainsworth, of Oswego; Hadley, of Franklin; Saxton, of Wayne; Dickey, of Rockland; and Conover, of Westchester. The meetings were held during the summer at Utica, Troy, Saratoga, Buffalo, Rochester and New York. The result was presented to the Assembly last week. The report, in substance, is as follows:

"The American Bell Telephone Company is a corporation organized under the laws of Massachusetts, with a capital of $10,000,000, which, under the present judicial decisions, owns and controls all patents now in use upon telephonic instruments in the United States. Except as a large stockholder in local companies, it does not operate any of the territory in this State. It does not sell any of the instruments manufactured under its patent, but leases them to its licensees at an annual royalty of $14 per set of instruments, excepting the Metropolitan Company of New York and the Commercial Company of Troy, which it charges $10 respectively, reserving the right to increase all these royalties at its pleasure. By the terms of its contract with the local companies these instruments are delivered to the local companies at the company's office in Boston. In addition to these royalties, it also exacts from its licensees a further consideration in the form of a donation of 35 per cent. of the capital stock of its licensees. It also exacts a commission upon an extra territorial and telegraph business done by the licensees of 15 per cent. of the former and 50 per cent. of the latter.

"The Westchester Telephone Company operates portions of Westchester and Rockland Counties, and was organized in 1882, and has a capital stock of $300,000, all of which has been issued, and $100,000 of which is owned by the American Bell Company as franchise stock. Its cost of construction is $372,196.07, and its net earnings for the past fiscal year were $13,937, showing a percentage of net earnings to cost of 3.7 per cent. The remainder of its stock has all been purchased by the Hudson River Company. Its average dividend since organization has been 2 per cent. It has 1,006 subscribers.

"The Staten Island Telephone Company operates Staten Island, and is a sublicensee of the Metropolitan Company. It was organized in September, 1883, having a capital stock of $135,000, all of which has been issued. Its cost of construction is $81,586.58; its net earnings for its past fiscal year were $6,474, showing a percentage of net earnings to cost of 7.9 per cent. The Metropolitan Company own $45,000 of its capital stock, issued to them as franchise stock. Its annual dividend has been 5 per cent. It has 272 subscribers paying from $60 to $120 per year, depending upon distance from central office.

"The New York and New Jersey Telephone Company operates Long Island, Brooklyn, Jersey City and outlying points. It was organized in 1883 with a capital stock of $2,400,000, all of which has been issued. It is a sublicensee of the Metropolitan Company, which owns $800,000 of its stock. Its cost of construction is $1,709,000, and its net earnings during the past fiscal year were $185,766, showing a percentage of net earnings to cost of 10.8 per cent. It has 5,317 subscribers, at an average rental of $70.56. This company has a special class of service furnished to 65 subscribers who are large users, at an increased rate of $720 per year. This subscriber, by actual count, had 18,000 connections with New York city alone, aside from his local use of the instrument. Another found by actual record kept that his telephone was used four hours and thirty minutes out of seven business hours, counting from the moment it was being connected with subscriber to the moment it was released. 'These instances illustrate the inequity of a State uniform rate,' says the report. These cases exist to a less marked degree throughout the State.

"The American Telephone and Telegraph Company was organized in 1885 with a capital of $100,000, and its business is confined exclusively to the giving of telephonic communication between different cities. It has never earned any money, and does not come under the spirit of the resolution appointing this Committee.

"The Metropolitan Telephone and Telegraph Company: The Committee review the conflict between the Western Union Telegraph Company, as owners of the Edison patent, and the Bell Company, as owners of the Graham Bell patent, out of the settlement of which grew the Metropolitan Company of New York. This company was organized in May, 1880, with a capital stock of $1,000,000, owned respectively by the American Bell Company of Boston and the Western Union Telegraph Company in the proportions of 60 and 40 per cent. It operates Manhattan Island only, although the territory operated by the Westchester Company, the Staten Island Company, and the New York and New Jersey Company, was originally embraced in its franchise. The royalty paid by the Metropolitan Company to the American Bell Company is $10 per instrument per annum. Its cost of construction is $1,871,116.94, $426,729 of this having been expended in the erection of the company's new building at No. 18 Cortlandt street. * * * Its expenses were: Operation, $458,151.71; reconstruction, $48,654.43; instrument rental, American Bell Telephone Company, $165,758.27; rental, Manhattan plant, $16,500; rebates, $1,750.79; roof rentals, $6,745.88; taxes, $12,000; insurance, $3,000; legal expenses, $13,500; miscellaneous, $2,315.19. Total, $728,376.27. Their average number of subscribers for the past year was 6,104, at an average annual charge of $148.93.

"The total number of subscribers to telephone exchanges throughout the State is 26,240. The total capital stock of the companies doing business in the State is $8,395,000. The total cost of construction of the plants of the various companies throughout the State is $5,780,978.43."

The Committee deal at length with the problem of underground construction, which they have met in Brooklyn, Buffalo, and New York. The Committee present an exhaustive brief summarizing the Federal and State decisions in a large number of states, upon the right of the Legislature to regulate the charges of local companies, and find that they have such right; also, upon the right of the Legislature to regulate the royalty charged by the American Bell Company of Boston, and find that they have not the right to regulate them. The Committee review the investigations in Rhode Island, Connecticut, Maine, New Hampshire, New York, Pennsylvania, Ohio, Michigan, Minnesota, Illinois, Indiana, Iowa, Arkansas, and Texas, with regard to this question, and review at length the legislation upon this question in Indiana, and its effects both upon the companies and the people. They treat of the various patents owned by the American Bell Company, and the interference between the caveats of Mr. Berliner and Mr. Edison, arriving at the conclusion that, at the option of the American Bell Company, its present control of telephonic instruments for practical use will extend for a period of seventeen years from the date of the settlement of this interference. The only remedy to defeat this, the Committee says, "will be the invention by another person of a telephone which shall render communication possible by means of what is known as the 'make and break' system, which, electricians say, is extremely doubtful."

The Committee think there is but one circumstance, which, in their judgment, would justify legislative interference; that circumstance is the imposition of a charge so large that it shall be a burden to those who use it, and which shall produce a revenue disproportionate to that return to which its inventors and those who put their money into it when it was an unsolved problem are entitled. That circumstance is found in the cities of New York and Troy; in the case of the latter, its franchise expires so soon that no legislation is recommended for that city. They believe the returns of the Metropolitan Company are larger than they should demand, and submit a bill making the charge in New York City $6.50 per month, with an added mileage of $2 per month for all points exceeding one-half mile from any one of its present central offices.

Two bills accompany the report of the Telephone Investigation Committee. The first limits the issue of stock and creation of liens by incorporated companies, and is as follows:

Sec. 1. No share or shares, stock or certificate of stock, shall hereafter be issued by any company organized or chartered by or under the laws of this State, except upon previous payment in cash of the par value thereof, or upon condition of service equivalent in value to par value thereof. A record shall be kept by each company of all payments for stock which shall show in detail the date and amount of each payment, the kind, amount and value of the service rendered for which any stock is issued, the amount of stock issued, where and to whom; which record shall be open at all times to stockholders of and any person dealing with such company, for inspection.

Sec. 2. No bond, mortgage, or other evidence of indebtedness shall be issued, given, or made whereby any lien upon any of the property of any company created or incorporated by or under the laws of this State, is, or is assumed to be created, until a statement in writing has been made and duly verified by the oath of the president, secretary and treasurer of the company, or a majority thereof, showing that the capital stock of such company has been actually paid in, and such statement so verified has been filed in the county clerk's office, where the principal business of such company is transacted; and any wilful misstatement or false statement contained therein shall be perjury, and punished as such.

Sec. 3. Any officer or other person who shall issue or assume to issue any share, stock or certificate of stock, or who shall make or execute any bond or mortgage, or cause any indebtedness whereby any lien is or is assumed to be created, contrary to the provisions of this act, is guilty of a misdemeanor, and upon conviction, liable to a fine of not more than the par value of the stock, or shares issued or lien created, or assumed to be created, or by imprisonment in the county jail for not more than one year, or by both such fine and imprisonment.

Sec. 4. This act shall take effect immediately.

The second bill regulates telephone charges in cities of 1,000,000 or more inhabitants, limiting the price of instruments within one-half mile of the central office in such cities to $6.50 a month, with $2 a month additional for each additional half mile of distance. A penalty of $50 is provided for every violation of the law. The act to take effect June 1.

Telephonic News

*** A telephone wire is being strung between Horton and Hiawatha, Kan.

*** A petition has been circulated in St. Louis to have the local rates for telephones reduced from $100 to $50.

*** The Erie Telephone Company has removed its exchange from Cleburne, Tex., on account of lack of business.

*** There are 281 telephone subscribers in Council Bluffs, Ia., and they make between 1,500 and 2,000 calls daily. The system includes 175 miles of wire and 25 miles of poles.

*** A patron of the telephone wants to know why the companies do not use silver wire, having heard that it was the best conductor. Possibly that gentleman would be satisfied with a Delmonico tenderloin, provided he could get it for ten cents, bread and butter and toothpick thrown in.

*** At the recent annual meeting of the Nebraska Telephone Company at Omaha, Neb., the following directors were elected: J. J. Dickey, S. H. H. Clarke, M. H. Goble, L. H. Toner, L. H. Korty, John Hudson, George Albree, J. W. Rodefer and E. M. Morsman.

*** The stockholders of the Rocky Mountain Bell Telephone Company, at the annual meeting February 27, elected the following officers: Geo. M. Scott, president; J. J. Dickey, vice-prest.; Geo. T. Wallace, treas.; Chas. Sidney Smith, secy., and C. F. Annett, genl. mgr. These gentlemen, with C. W. Lyman, George Albree, Thomas Sherwin and Harry C. Hill, form the board of directors.

*** The New Market and Dandridge (Tenn.) Telephone Company met Saturday the 18th ult., at Dandridge, and organized by the election of Jesse L. Rogers, president, W. F. Park, secretary, and G. W. Long, treasurer. All the subscribed stock was paid into the treasury, and the contract for the erection of the line will be let to the lowest responsible bidder. Dandridge is situated 10 miles distant from the railroad, and is the county seat of Jefferson County.

*** The following has been received by the Mexican Telephone Co. in Boston, from the City of Mexico: "The effect of the recent telephone decision by the federal court is becoming more apparent every day, and many who discontinued the service of the company some months ago are renewing their connection. It is expected that heavy damages will be awarded the company for damages sustained by infringement, which, with the decision of the court maintaining our privileges, strongly and powerfully made in all points of the republic, will place the corporation on a basis of financial prosperity never before enjoyed by it."

*** Romantic attachments are formed between telegraph operators who never met, and many possibly never see each other. Men working the same wire for any time are apt to get "chummy," and hold confidential chats during the intermissions of business. When I was working (says an old telegrapher) on the old A. and P. in Boston, I made the acquaintance of a fellow in the New York office, and we became so intimate that I believe I would have recognized him if he walked in and spoke to me. We had arranged a meeting; I was to run over from Boston and spend a week in New York. All our pleasures were settled, and we were anticipating the time with great relish when, through some cause, he hurriedly left for the West. I afterwards went out on the Northern Pacific with the advance of the construction forces, and then swung around to Salt Lake City, and after touching at several Pacific Coast points, rounded up in Louisville. A couple of years later found me in St. Louis, where, at the end of my first week, I began inquiring for my old New York mate, and was startled to find that he was dead, but had worked the key at which I was sitting for eighteen months.

ELECTRICAL PATENTS

(Copies of any Patents in the following List wi be sent to any address on receipt of twenty-fiv cents.)

INDEX OF INVENTIONS FOR WHICH LETTER PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MARCH 6, 1888.

378,864 Apparatus for the propulsion of cars b electrical energy; Alexander H. Bauer, Bosto Mass.

378,876 Electric ship signal; John W. Dooley Wyoming, Ill.

378,892 Magneto electric machine; Osborn H Loomis, Somerville, Mass., assignor to the Loomi Electric Manufacturing Company, New York, N. Y

378,927 Police, fire and district telegraph; Ed ward T. Gibson, Minneapolis, Minn.

378,943 Carbon battery; George E. Terrell, Ar sonia, Conn.

378,971 Insulator; Lewis M. Neal, North Middle town, Ky.

378,980 Electric railway car brake; Wm. M. Schlesinger, Philadelphia, Pa.

378,983 Fire alarm signal box; Alson A. Smith Newton, Mass., assignor of one-half to Frederic W. Cole, same place.

379,016 Electric telegraph; David Kunhardt, Aachen, Prussia, Germany.

379,037 Dynamo electric machine; Oscar Urba and Merle J. Wightman, Hartford, Conn., sai Urban assignor to the Schuyler Electric Company Middletown, Conn.

379,060 Telegraph instrument. 379,061 & 4 Tele graph sounder.

379,062 Pole changer. 379,063 Telegraph key Emery M. Hamilton, New York, N. Y.

379,069 & 379,070 Electric railway; William W Hopkins, St. Louis, Mo., assignor of one-half t Irving McGowan, same place.

379,073 Continuous and alternating transformer Francis Jehl, Paris, France.

379,074 Electrical contact maker and breaker Carvosso Lambdin, Barranquilla, United States o Colombia, assignor to Samuel B. Lambdin, Ne York, N. Y.

379,081 Spring jack for electric railways. 379,0 Slot switch for electrical and cable railways; Si ney H. Short, Denver, Colo., assignor, by direct an mesne assignments, to the United States Electri Company, same place.

379,144 Burglar alarm; Charles H. Wrigh Chicago, Ill.

379,203 Telegraphic repeater; Joseph Kölze Duisburg, Prussia, Germany.

REISSUES.

10,907 Electrical apparatus for dental opera tions; Chas. A. Eisenhart, York, Pa.

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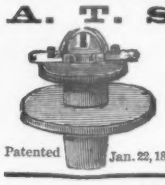

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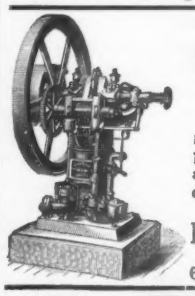

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